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SUBMARINE ALTERNATIVES STUDY

HEARINGS

BEFORE THE

SEAPOWER AND STRATEGIC AND CRITICAL MATERIALS SUBCOMMITTEE

OF THE

COMMITTEE ON ARMED SERVICES
HOUSE OF REPRESENTATIVES
NINETY-SIXTH CONGRESS
SECOND SESSION

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HOUSE OF REPRESENTATIVES,
COMMITTEE ON ARMED SERVICES,
SEAPOWER AND STRATEGIC AND
CRITICAL MATERIALS SUBCOMMITTEE,
Washington, D.C., Tuesday, September 25, 1979.

The subcommittee met, pursuant to notice, at 10:15 a.m., in room 2216, Rayburn House Office Building, Hon. Charles E. Bennett (chairman of the subcommittee) presiding.

Mr. BENNETT. This morning we will continue with our hearings on new submarine designs. Dr. David Mann, the Assistant Secretary of the Navy for Research, Engineering, and Systems is here to provide testimony on the Submarine Alternatives Study recently completed under his direction and now undergoing review by the Office of the Secretary of Defense.

The subcommittee is responsible for authorizing the major combatants which will eventually make up our future fleet. The attack submarine is key to that fleet. To obtain the force levels consistent with the minimum number of submarines required, we must approve more than one attack sub per year. Costs are important. However, acquisition costs alone must not determine what type of submarine will someday enter the inventory. Capability is critical. It serves no purpose to fund and maintain a fleet of submarines that are not effective in combat against the projected Soviet threat.

The Soviets are delivering to their fleet some 10 new nuclear submarines each year. Their production facilities are extensive. Their overhaul and support facilities are even more impressive. The data is obvious; the Soviets believe the modern submarine is fundamental to their seapower philosophy and will continue to dominate their thinking.

At a time when the Soviets are developing the fast, deep-diving attack submarines, capable of launching long-range cruise missile and even longer range ballistic missile, the Defense Department appears to be moving toward a somewhat less capable submarine.

Speed, whether maximum speed or maximum quiet speed, is a major consideration. However, survivability, and most important, flexibility, is just as important. No one's crystal ball can determine how the next conflict will be won or lost. Scenarios are helpful, but as every significant military effort waged has demonstrated, it was not fought by the textbooks.

I hope your testimony today will enlighten the subcommittee and eventually the Congress as to the current thinking with regard to future submarines. I might add that the Defense bill passed by the House for fiscal year 1980, contains two 688 attack submarines. I need not remind you that paper submarines cannot replace the reality of long patrols in distant locations.

The subcommittee requested your testimony today as the Department of Navy official responsible for guiding the direction of future Navy weapon systems. The decisions will determine the type weapon system sent to sea some 12 to 20 years from now. It is most important these decisions are understood by the Congress and the American people.

Tomorrow the subcommittees will receive testimony from the Deputy Chief of Naval Operations for Submarine Warfare. Admiral Griffiths, and other representatives from Naval Sea Systems Command as to the operational considerations that must go into the important decisions.

Dr. Mann, we are glad to have you with us and look forward to your testimony.

STATEMENT OF HON. DAVID MANN, ASSISTANT SECRETARY OF THE NAVY FOR RESEARCH, ENGINEERING, AND SYSTEMS

Dr. MANN. Thank you very much, Mr. Chairman, members of the committee.

With your concurrence, Mr. Chairman, I will try to proceed as long as I can on an unclassified basis. At some point during the presentation however, I will show classified viewgraphs. I would suggest, because of them, we be prepared to go into closed session.

Mr. BENNETT. Whenever you feel it is necessary to do so, we will.

Dr. MANN. Thank you very much.

I welcome this opportunity to present to you and discuss with you the findings of the Submarine Alternatives Study as they pertain to nuclear attack submarines. Our basic purpose in undertaking this study was to examine and, as far as possible, stimulate further consideration of, and I now quote from Secretary Claytor's directive initiating the study—options which offer the prospect of significantly reducing costs while retaining operational adequacy.

We believe that this objective has been achieved.

From its outset the study had the benefit of participation and close cooperation by the staffs of the Chief of Naval Operations, Admiral Hayward, and the Chief of Naval Material, Admiral Whittle. When, late, in 1978, it became clear that further significant cost savings could be realized along the lines illuminated by the study the Chief of Naval Operations directed that a much more detailed design study be undertaken by the Chief of Naval Material. Copy of his direction to the Chief of Naval Material is contained in the summary volume, No. 1, of our study.

While not yet complete the preliminary results from this complementary effort are consistent with the cost and performance projections developed by the Submarine Alternatives Study.

It is our intention and hope that the data and analyses from these new studies will provide a firmer basis for judging the options and opportunities open to us in addressing the goal of maintaining and strengthening our Nation's submarine forces.

The Navy is faced with a major and near-term problem of replacing a large number of operational ships and submarines as they are retired at the end of their service lives. Many of them, particularly

the submarines, were constructed and deployed over a relatively short period back in the early and middle 1960's. The pace at which their replacement must occur to avoid serious gaps in capability will impose yet a further strain on our shipbuilding budget. Without further action the present attack submarine construction program will lead to a significant deficiency in force levels in the 1990's.

An increase in the building rate and the number of new attack submarines can come about in only three ways: Through a large and unlikely growth in the Navy's total shipbuilding budget, through unacceptable offsets from other parts of the present overall shipbuilding program or through significant reduction in unit costs which can be translated into increased rates and numbers. It is this latter option which the Secretary of the Navy, Mr. Claytor, directed the Submarine Alternatives Study to examine, with special emphasis on developing the basis for the tradeoffs between potential savings and operational effectiveness.

It was also obvious from the normal leadtimes for design and construction that if the options for initiating a new class for the 1990's are to be given timely consideration the analysis had to start right away. In its consideration of nuclear attack submarines the study focused its attention on opportunities for maximizing cost savings while preserving operational capability at a level no less, and preferably greater, than that of the current *Sturgeon* 637 class.

Also, it was understood any new design class would be additive and complementary to the currently authorized fleet of *Los Angeles* or 688 class submarines that would exist, in the 1990's. Hence, the submarine options examined were bounded by design on one side by the 637 class types and on the other by the *Los Angeles* class.

Furthermore, if the new class were to become operational in 1989 or 1990, it was clear at the outset that only prudent, relatively low risk and state of the art technology and propulsion systems could be considered. We were determined not to embark on long-range R. & D. activities or to invoke the use of technology which was either in a high risk status or not yet fully developed. The purpose here was to see if one could save money by using the best available technology today but not to embark for this purpose on a range of new R. & D.

Adherence to these conditions meant that every submarine design that was considered had to provide for quieting no worse than, and preferably better than the 637 class, depth capability comparable to the 688 class, a combat suite, a weapons load, shock resistance and safety provisions, all of which are comparable or better than what is currently available in either the 637 or the 688 classes, as appropriate.

Analyses of factors that determine or affect construction cost for both the 637 and 688 classes, show that while further savings could result from improvements in design and construction practice and should be undertaken as an ongoing activity, major savings could be realized only through significant limitations on size and displacement. This is something which I think is intuitively obvious to everyone, and one of the principal objectives or purposes of the study was to examine, as fully as possible, the data base within the Navy and to see if there was in fact sufficient consistency to allow these conclusions to be drawn.

This constraint would in turn necessitate use of existing reactor and propulsion systems smaller than what is currently employed in the 688 class submarine. Despite the compensating effects of a smaller hull, the use of a smaller propulsion system would result in some drop in maximum speed, with results expected to fall somewhere between the 637 and 688 classes. The problem was to find ways of analyzing and quantifying the value of the differences in the top speed between any new candidate design and the 688 class for all of the assigned standard operational tasks in relation to the estimated savings in cost.

The study really had to deal with two major or key tasks. First, it had to show that the costs can be rationally related to nuclear attack submarine design elements, in a consistent and quantifiable way. If the costing of nuclear attack submarines is not explainable or reliably predictable, there really would be very little point to studies of this type. One would have to depend mainly on unquantified judgment and intuition as guides in the decision process.

For this reason, every effort was made to understand in great detail the Navy's cost experience in building nuclear submarines. Second, the study had to analyze the influence of the top speed margin on the candidate submarine performance in all of its assigned tasks excepting the escort of carrier task forces at high speed. This was obvious from the first as a task for which the 688 class is especially well suited and for which the authorized fleet could suffice in the event that no more were to be built.

I might add, as a parenthetical comment, Mr. Chairman and members, that very early in the discussions that led to the shaping of the study—approximately June of 1978—discussions were held with the CNO and Vice CNO and other members of OPNAV. It was in that context that this last statement I made was discussed. It is a point that I will return to later; namely, the 688 class in both numbers and performance is especially well suited for the escort or direct support of high speed carrier task forces.

Turning for a moment to the costing element of the study, the entire usable nuclear submarine cost data base available to us through the courtesy of the Naval Sea Systems Command, comprised of 68 SSN's, and 39 ballistic missile submarines. For about two-thirds of this data base the final—or the so-called return—costs actually paid by the Government are available.

These costs, I might add, include everything that the Government has paid to date. For the submarines now in production the costs are based partially on estimates, again supplied by the Naval Sea Systems Command. For this reason the data are somewhat less complete and perhaps less reliable. To be useful all of these costs had to be converted to a specific year, fiscal year 1980, so the effects of prior price changes in the narrow world of shipyard construction and equipment suppliers not just overall inflation, are fully taken into account.

With this adjustment, it was possible to relate cost to the design.

The next step required that submarine costs be split in two separate parts: First, there is the cost of Government-furnished equipment such as powerplants, electronics, and the like which account for about one-third of the total. I will show you a detailed breakout of this in

a few moments; Second, the cost of submarine construction which comes to about two-thirds of the total.

As you will see when I show you some of the viewgraphs what is most remarkable about this result, after having examined all of the data supplied and all of the data available to us, is the consistency over the entire submarine building program, irrespective of type, going back to the early 1960's, including ballistic missile submarines as well as the 637 class attack submarines. The spread in the data is remarkably small. If the study accomplishes nothing else but making available that information to the Congress and decisionmakers in Defense and Navy, it will have been a significant achievement. When construction costs are all adjusted to fiscal year 1980 dollars the variations in the data overall are less than plus or minus 10 percent. Again, I stress this result includes both SSBN and SSN data. If one were to limit the data base for this purpose to SSN's, the spread would be even smaller. The results show our ability to estimate cost of submarines is probably good this level of uncertainty, provided the influence of unanticipated price escalation can be avoided.

The data show that the cost per ton to construct a submarine is and has been fairly constant over time, moderate changes in design, and is largely independent of size. It is quite remarkable, in fact, when you look at these data to note that the smaller SSN's and the larger SSBN's, perhaps even including the Trident, show relatively little variation in this respect. This leads to the important result that construction cost is directly relatable and proportional to displacement. In fact, it is very closely linear. In other words, a nuclear submarine which has five-sevenths of the displacement of the *Los Angeles* class ship should, in constant dollars, cost about five-sevenths as much to construct. The data support that conclusion.

However, the key to confidence in projections that are based on these estimates is—and I can't stress this strongly enough—a smooth and well-planned production schedule that allows for continuing competition and most efficient use of available shipyard capability.

The consequences of differences in top speeds were evaluated, including the effects of transits and compared for various designs and classes with respect to standard submarine tasks.

Again, as always, excepting the high speed task force escort or direct support role, the effect of speed on engagement effectiveness, was assessed primarily on the basis of simulation models that had been developed by the Naval Undersea Systems Center at Newport for and routinely employed by the Deputy Chief of Naval Operations, Admiral Griffiths. The tasks that have been evaluated in this review include the fixed-barrier antisubmarine warfare task; the moving-barrier, antisubmarine warfare task where the submarines are directed to conduct an ASW sweep, as they advance; area clearance in which the submarine is assigned to a specific area and is essentially on a search or a detect and destroy operation; vectored intercept, where a submarine is directed, usually at fairly high speed to the expected location of the threat and finally, antisurface ship warfare. The analysis demonstrated that all candidates could perform all of these tasks. And a little later I shall show you a table in which all of the results from the simulations are presented.

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Since in general U.S. submarines take advantage of superior quieting to achieve surprise, and to place themselves in a condition to attack an enemy without being counterdetected, greater use is made of maximum quiet (or listening) speed rather than top speed during operations when threats are present.

Moreover, as acoustic detection sensors, homing weapons, and longer range weapons are improved by our potential adversaries as well as by ourselves, the premium placed on maximum quiet speed, the employment of greater stand-off range, and avoidance of counterdetection rather than on top speed, is likely to increase.

This is not to say maximum speed is a secondary consideration by no means. The question is, has been, and from the standpoint of this study continues to be: How much is the margin in top speed worth in numbers of additional submarines. Now given—and this is a very important point which I have already stressed a number of times—given that a fleet of *Los Angeles* class ships will be available for the task that requires the extra speed and for which appreciably slower submarines are not suitable, that is, the escort task, this question is being addressed at the present time in more detail in the fleet attack submarine design study directed and commissioned by the CNO in late December of last year and which has been conducted under the direction of Admiral Webber for the past 9 months or so. This study is investigating a range of submarine alternative study candidates.

Let me summarize by saying that the study, making use of all available cost data, and technical anlysis by analysts, engineers, naval officers, and the at sea experience of operational submariners developed an explicit basis for relating submarine acquisition cost with performance and effectiveness and for further development of a lesser cost but still effective submarine. That was the charge and the charter given to us by the Secretary of the Navy. That is what we limited our study to. We believe to a large extent the study has served to provide new insight and to illuminate those questions and those issues. The study should provide the Congress, Defense, and the Navy with greater visibility into many of the factors that must be considered in planning future submarine building programs on the strong base provided by the *Los Angeles* class ships that we expect to have in the 1990's.

Now, Mr. Chairman, that is all I have to say by way of opening remarks.

Mr. BENNETT. Without objection, the entire statement will be incorporated into the record.

Dr. MANN. With your permission, I would like to show you an overview before we need to get into a closed session. This is of the organization and some of the key results, particularly on cost that are derived from the study.

Mr. BENNETT. We will take a vote as to whether, at the discretion of the chairman we will have a closed meeting today and one following session.

Mr. SPENCE. I move that the Chair be given authority to go into executive session today and one following day if necessary for the purpose of receiving classified information.

Mr. BENNETT. We will have the rollcall, please.

[Whereupon, a rollcall was taken.]

Mr. HALE. The vote is six ayes and no nays.

Mr. BENNETT. Unless there's something else you feel you can say in open session——

Dr. MANN. We don't have to go into closed session just yet. I can show VuGraphs dealing with cost in open session. Then we can proceed after we get into performance data in closed session.

Mr. BENNETT. All right, sir. Go ahead.

Dr. MANN. I have already reviewed this, but for the purpose of summarizing and stressing this, the objectives of the study were to explore the options for lower cost mission capable submarines, both attack as well as ballistic missile submarines. Also, we emphasized near term technology and designs that we felt would allow for early ship availability. That was throughout our considerations.

Finally, our objective was to identify and to analyze those factors that drive cost and can be related to effectiveness and performance. In the same context let me stress what the study does not and did not attempt to do. We specifically do not and did not intend to indicate a particular option. Our purpose is to provide a basis for the reviewing of information that would allow insight to be developed on the part of the decision authorities, rather than for us on behalf of the Navy to indicate a particular solution.

Indeed, let me stress further at this stage it is not clear what the optimum solution is or even what it should be. One reason is that as the designs evolve further, the design studies I alluded to that are currently being conducted by NAVSEA under Admiral Webber and others, they have to be measured in terms of effectiveness and in terms of cost saving against alternatives that, for example, could include continued procurement of 688 class submarines.

Now until that phase of the effort has been completed, is it likely that the CNO and others would be in a position to make a specific recommendation? However, what has been done is to illuminate the basis on which lower cost can be achieved and to estimate the effect of the lower cost decision on total effectiveness.

This relates principally to the SSBN cases. We did not analyze or attempt to justify particular force levels. We certainly were not going to compare the use of nuclear submarines, whether in an attack role or in a strategic role, with other national programs. We were not going to trade submarines with aircraft, for instance.

Finally, we recognized at the outset that one could hope to save appreciable cost by making certain improvements and changes in the design for producibility and the use of production engineering techniques at shipyards. Some of these techniques, in fact, are already being proposed or employed. We chose in this study not to try to examine this. Finally, we stayed completely away from making any recommendations regarding management or operational matters.

Finally, we stayed away from very large technology excursions to avoid the uncertainties, risks, and time delays that this could involve. The general outlines of the study directed by the Secretary of the Navy, with the study director and his staff reporting to me, included a steering committee that met from time to time either with me or with him or both. There was a technical review panel whose members

were chosen for the diversity of their views and past experience, along with a number of senior submariners, both active duty as well as retired. Some of these names are very well known to you. Rear Adm. Levering Smith, for example, formerly from NAVSEA, Admiral Griffiths from OPNAV, Vice Admiral Small, who is commander of the 7th Fleet, Admiral Waller, prospective commander of the 3d Fleet and Vice Admiral Bryan, Commander of the Naval Sea Systems Command.

Among technical people there was Dan Fink, senior vice president of GE, and Dr. Fubini, formerly in the Department of Defense. He is now a consultant to the Department. I might say, that Mr. Fink was a Deputy Director of Research and Engineering during the days of John Foster, among others. John Foster was here when many of the decisions were made for present programs. Mr. O'Neill, chairman of the Naval Research Advisory Council, was also involved.

We had a costing division, a missile and guidance division, an analysis division and a submarine design division. We had a submarine operations division which involved the participation of active duty captains familiar with both SSN and SSBN operations.

Finally, there was a great deal of support from within the Navy, through OPNAV as well as NAVSEA. Now the logic train that was followed—as I've already indicated in my opening remarks—was to start with the plan to design any candidate submarine for equal or better performance with respect to acoustic quieting. There is no degradation, in weapons load, nor in the combat suite. Depth capability is comparable to what is currently in the fleet, as is shock resistance.

In order to achieve a large cost reduction we have to reduce displacement or we have to make major changes in design and construction. I have already commented on those. We examined the effects of changes in displacement. To get a large reduction in displacement we have to make reductions in size. This translates into lower shaft horsepower or smaller but existing propulsion systems.

TABLE 12.—NUCLEAR SUBMARINE RETURN COST DATA BASE

Ship class	Number	Years of construction
SSN-637	28	1962 to 1972.
SSN-678	9	1967 to 1975.
SSN-688 [1]	(31)	(Beginning in 1970.)
SSBN-616	9	1961 to 1964.
SSBN-627	10	Do.
SSBN-640	12	1963 to 1967.
SSBN-726 [1]	(8)	(Beginning in 1974.)
Total	(107)68	

[1] Costs based on limited return cost data plus NAVSEA estimates.

During the classified portion I will tell you which one was examined. We have to be willing to accept some loss. It is not clear at the outset how much. But we must accept some loss in top speed. The top speed loss, however, can be minimized by not only the fact that the submarine itself is smaller –there is less mass—but also by employing the improved design and improved shape. The data base which I had alluded to earlier consists of the following 107 cases of which the ones not in

parentheses involve return costs. Those from the 688 class are shown. As you can see, we go back to the 637 class. And we have 37 cases of those. We include the 616 and the 627 and the 640 classes of SSBN's.

In effect, we are looking at data which goes back essentially almost 20 years. These data, by the way, and the indices that they reflect were supplied to us by the Naval Sea Systems Command. We did not attempt to generate our own data. I apologize for the density of this Vugraph and I hope that you can all read it. I believe it is a very interesting and important one.

TABLE 13.—HISTORICAL SUBMARINE SUBSYSTEMS COST DISTRIBUTIONS[1] (AVERAGE AMONG FOLLOW SHIPS)

Subsystem category	Cost distribution (percent)	
	SSN	SSBN
1. Ordnance (weapons)	3±0.5	19±2.0
2. Government-furnished material	35±1.0	11±3.0
Electronics	24.0 +9 −3	24.0 +3.0 −1.0
Propulsion	48.0 +2 −6	23.0 ±2.0
Hull/mech/electrical	18.0 ±4	12.0 ±2.0
Other	2.0 ±2	3.0 ±.5
Ordnance equipment	8.0 ±3	30.0 +3.0 −1.0
Total	100.0	100.0
3. Construction and plant (shipyard)	62±.5	50±4.0
Hull	17.5 ±2	17.0 +5.0 −2.0
Propulsion	12.0 +3 −2	7.5 +2.0 −1.0
Electric	4.5 ±1	4.0 +2.0 −1.0
Communication and control	4.0 +2 −1	5.0 +2.0 −1.0
Auxiliaries	17.5 +3 −1	14.5 +3.0 −2.0
Outfit and furnishings	6.0 +1 −2	7.0 ±1.0
Armament	3.0 ±2	10.0 +3.0 −2.0
Design and engineering	5.5 +1 −2	4.5 ±1.5
Construction services	16.0 +1 −2	14.0 +2.0 −1.0
Profit	9.0 +1 −6	10.0 ±2.0
Plans	5.0 +2 −1	6.5 ±1.0
Total	100.0	100.0

[1] Developed from NAVSEA-provided data.

I have alluded to the consistency of all of the classes. Let me explain the categories, and the significance of some of them. I will not go through every one. Government-furnished material, GFM, is a major category which represents a major fraction of cost. There is construction and plant or shipyard cost. The numbers shown here in the upper and lower case and the pluses and minuses represent the maximum excursions over the entire data base.

In the case of SSN's and SSBN's, the largest number here is plus 9 percent. Most numbers fluctuate around 1, 2, or 3 percent. Again, as one looks across all of the earlier construction, or construction programs for the SSN's, there is a remarkable constancy of the percentage of the cost in both GFM and construction. In round numbers, about

two-thirds of the cost goes for construction and about one-third goes to GFM. This is for all the nuclear attack submarines covered by the data.

This goes to the point that is missed by critics of the Navy who have quick cures for high costs.

What these data show is that there is a broad distribution of cost. Across all of these categories there is no one dial or knob that one can turn to sharply reduce cost. As a matter of fact, let me pick one that was recently advanced by the advocates of nonnuclear propulsion, of whom there are a number.

Let us look at an SSN, for instance. The fraction of the total construction cost that is represented here for propulsion is about 12 percent. It is 12 percent of 62 percent. That is a relatively minor one. Even in the case of the GFM, the reactor and the associated equipment is about half of 35 percent. So, even here, this represents only about 16 percent or 17 percent of the total cost.

The point, Mr. Chairman, is that there is no one element that so dominates the cost that it can be dialed up or down and make a major difference. You can save cost only by looking at all of the factors together. That is what makes this a very complicated problem and one that requires a good deal of sophisticated design work, as in the case of the fleet attack submarine design study which is now underway. I won't discuss the SSBN case; it is quite analogous. The principal difference is that, out of the 100 percent of the total cost of the submarine, about one-fifth normally goes to the missiles, about 30 percent goes to GFM, and about half goes to construction. If we concentrate our attention on the SSN's, it can be seen that there is consistency that is quite remarkable, considering that we have covered almost 50 submarines.

To show the result or possibility of making projections in yet a different way, we should note that these are actual costs. In the case of the 688 class and Trident, the best that NAVSEA could estimate as of the time the chart was prepared. The study group used the methodology that is described in considerable detail in the summary as well as the cost volume. This methodology involved estimating construction cost largely as a function of the weight and tonnage and GFM by adding up the parts inventory.

Now, the thing which is amazing about this is the fact that the relation between any of the estimates that we have employed and the actual cost can be put practically on a straight line if we use all the data we have, and that this straight line can take account of a very long extrapolation in the case of the Trident.

If we look at the attack class, there you find that the cost data scatter within just a few percent. The point here is that this result gave us confidence that we could now interpolate and extrapolate from the data base for a new candidate. The data support our contention that one can project costs pretty well.

This next chart is practically a do-it-yourself kit for estimating submarine cost, if we deal only with the dry weight and covering both the SSBN's and SSN's.

You will notice a very interesting thing. Let us look at the SSN case. All of the SSN's we have covered up to, and including, the best esti-

mates that we have from the 688's, cost about $26,000 or $27,000 per ton. This is despite the fact that we are going in many instances from under 5,000 tons total submerged displacement—A–1 weight is about 80 percent of that—and up to the 688 class, which is on the order of 2,000 tons or more. The scatter here between contractors is greater than the overall scatter for the total range of data.

Now, even if one includes the SSBN data, you find that the numbers are just in excess of about $30,000 per ton. So, this is, again, another way of representing what I've already said. If you decide that you want to have a cheaper submarine, setting aside now changes in design and production of the existing submarines, you can achieve it by making the submarines smaller. Depending on how much smaller you make it, that is how much money you are likely to save.

At this point, if I may, Mr. Chairman, I would like to turn to a few classified viewgraphs and describe to you some of the actual data that have come out of the study relating to the performance and effectiveness.

Mr. BENNETT. What does the committee want to do about asking questions before we go into executive session?

I recognize Mr. Spence.

Mr. SPENCE. Mr. Chairman, if we don't get unclassified questions and answers, that would not be useful to the committee.

Mr. BENNETT. We can ask questions at this point first. I recognize Mr. Spence again.

Mr. SPENCE. Thank you, Mr. Chairman.

I heard somewhere, Dr. Mann, that the Navy was planning to build smaller, slower, cheaper attack submarines beginning in fiscal 1983. Is that correct? Do you know if this is now correct?

Dr. MANN. There is current planning and, at least, tentative acceptance within the Department of a plan which is aimed toward a 1983 authorization for some new class of submarines, the so-called SSN–X. I have already alluded to this. What isn't certain yet is exactly what the SSN–X would be. Clearly, there is a strong desire to have them cheaper than the current class.

Mr. SPENCE. Yes.

Dr. MANN. But whether it will be an entirely new class, such as I alluded to as the fleet attack submarine class, or a reengineered 688 class is a decision that has not as yet been made.

Mr. SPENCE. Thank you.

Dr. MANN. Yes.

Mr. BENNETT. Will you yield?

Mr. SPENCE. Yes.

Mr. BENNETT. There is one question. Is this to supplant some of the planned 90 688's? Will it do this for 1990? Is this an additional submarine over those that are planned?

Dr. MANN. The Navy, as you know, has a force level requirement that it has had for years of 90 attack submarines. We have not, as far as I know, made any projections on how many of the 688's we would plan to procure. At the present rate of roughly 1 per year, it is clear that we are not going to achieve 90 for a very, very long time. In fact, we would end up with a gap because of the fact that the 637 class would be dropping out. So, what has been done at the present time is

to consider the possibility of some form of mixed force where we would count on having on the order of 35, 36, or 37 of the 688 class submarines.

Now, as to deciding on either, and I stress this, either a reengineered 688 for lower cost or a new class of submarine, that decision has not been made. But, in one way or another, we want to attempt to accelerate the rate at which we can achieve the 90 force structure.

Mr. SPENCE. What concerns me is we have had an edge and relied on the more capable submarine. I refer to quality, Dr. Mann.

Dr. MANN. Yes.

Mr. SPENCE. We are on the short end of quantity because we are outnumbered by a good many numbers. What concerns me is that the Russians, I understand, are going more now in the direction of increased speed, using titanium or a titanium hull. In short, with all their numbers, now they are going toward more capable submarines. We seem to be going back to the other direction. That's what concerns me. Why do you think they are going to more capable submarines and we are going to less capable submarines?

Dr. MANN. I think I could offer a number of comments on that. I think that is an appropriate question to pose tomorrow to Vice Admiral Griffiths.

Mr. SPENCE. To the Admiral?

Dr. MANN. Yes.

Mr. SPENCE. I want to ask him that.

Dr. MANN. Now, something I could respond to would lead me to request that we go into executive session. First, let me make the following observation.

Mr. SPENCE. Yes.

Dr. MANN. I think it is very important to note in this connection that the U.S. Navy Submarine Force not only has superbly qualified and trained people that contribute to its effectiveness, but there are submarines of extraordinary effectiveness as well. The quality depends on a large number of factors. It doesn't only depend, for example, on top speed in normal operations for most warfare missions where engagement and destruction is the objective.

The submarine must depend most critically on its ability to remain undetected and be able to approach the enemy while being undetected.

To do this, the submarine is not generally going to go at maximum speed. We would all be happy, I would, and I know the submarine community and the CNO would be happy to have submarines that provided all of the speed capability of the 688 class. The problem is that we also need numbers. We know we are going to fall short.

So, Mr. Spence, the question, again is, How much is that margin? I will describe quantitatively what that margin is, or could be. How much is that margin worth in extra submarines? That's a decision that has yet to be made. But to get back to your point.

We feel that the issue of quality must be understood in terms of the sensors, weapons, and quieting which determine the range at which we can detect the adversary, the degree to which we can close in on him before he hears us, and thereby avoid a shootout.

Mr. SPENCE. Yes.

Dr. MANN. That is something that has to be considered in a broader context than merely the speed or depth.

In the case of the reports about the Soviet submarines, I would like to defer commenting on those until we go to the executive session.

Mr. SPENCE. Yes.

Dr. MANN. I'm quite familiar with the information that we have and with some of the things that we have either available to us or that we expect to have available to deal with this, Mr. Spence.

Mr. SPENCE. I can understand and agree with you on the numbers, but, still, the question of the numbers has concerned me. If we are building, say, one a year now and have added one more this year on the committee, but to keep on, to keep up and overcome the obsolescence, then we have to build more. I don't see how we can do this, even if we start building cheaper submarines. This still worries me. You are concerned about numbers. I am, too.

Dr. MANN. Yes.

Mr. SPENCE. I think that, more important than numbers right now is the will to do. People in the Nation have to realize this. The Russians have a lot more in number than we do right now. Beyond that, they are building a great many more than we are. How many more submarines are they building each year than we are? Do you know that, Dr. Mann?

Dr. MANN. Maybe 8 or 10 to 1. It depends on the type, Mr. Spence.

Mr. SPENCE. Would you say 12 to 1? In any event, what kind of a capacity, a shipbuilding capacity, do we have right now to build more than just 1 or 2?

Dr. MANN. Now, Mr. Spence, I may be corrected if I'm making a mistake, but I believe that if we could satisfy ourselves and the people that have to be on the front lines, the submariners, that the submarine that they would be getting would be satisfactory and effective for all the purposes we discussed, then it would be at least conceivable with the yard capacities at Electric Boat and Newport News, the only two private shipyards in the submarine-building business, that we could probably build as many as four or five a year. It could be two and two.

Mr. SPENCE. You just made my point. Even if we could and did, and had the will and leadership to get this through the Congress, we've gotten ourselves into this position.

Dr. MANN. Now, if you mean to compare our building rate with the Soviet building rate, it is true that we are not in a position to build at the same rate they are.

On the other hand, there is no reason why we feel any necessity for matching them on a 1-to-1 basis any more than we do in any other weapons system. I think our submarines are very capable and have a different set of functions to perform than the Soviet submarines. This is to the point where the force structure of 90 is adequate in the view of the CNO. This is just a hope rather than a specific objective, but we would like to have more than this, or as many as 120, 130 or maybe 140. The problem is one of cost and of priorities.

Your point about national will is a very good one.

Mr. SPENCE. Yes.

Dr. MANN. If there were any way for the Navy to be in a position to fulfill in its shipbuilding program the needs it has for both surface ships as well as submarines, then there might be a little question about the desirability of going on with the 688 class submarines. The problem is that we have somehow got to fit 10 pounds of meat in a 5 pound bag.

Mr. SPENCE. I understand that. That is the point I am trying to make. Even if we had the will and could do this, we could not match them even building at four a year.

What concerns me, as I started to say earlier, is they are going to more speed with titanium hulls and more capability. They have the will to do it. They are putting the necessary money into doing it. What concerns me is why haven't we now developed the titanium hull? Is it too expensive or do we lack the will to do it? Is it both? Which is it, Dr. Mann?

Dr. MANN. It is hard to say why we haven't done it. I don't think it is a question of will. It might be a question of expense. Our view, and this is a question that I urge again you address tomorrow to Vice Admiral Griffiths, is that we have a good thing going with the submarines that we have developed. We know how capable they are. We have ample evidence to that fact.

I think that you all know we have no doubt whatever that they are extremely effective in carrying out their missions. We would not today trade our force for the Soviet force, not by a long shot.

Second, in terms of the enhanced capability that you alluded to, more speed would be very desirable, more than what the 688 has. There are occasions when that might be useful. But for the kind of warfare missions or warfare roles the attack submarines are intended to fulfill the operators' stress is on weapons and on the superior reach and sensitivity for the combat suite. It is to avoid getting into close quarters. There would be a greater standoff range so that you can hear, track and fire at the adversary before he hears you and before he can get a shot then at you. You never expose yourself if you don't have to. The stress is on being quiet. Yet there is no question you need speed to a certain level.

Let me pose this question also, sir. I don't profess to know the answer, but the key issue is this. Let us say the 688 class has a speed of x. I don't want to quote a number until we are in executive session, and suppose you could build a submarine that cost 25 percent less, with a speed that is only 1 knot less than the 688. How would you react? Would you say that 1 knot is nice, but it is not that important. For a very big gain in cost at the expense of a small difference in the speed, I think that most of you, most of us, would not have to think very hard.

The problem isn't that simple. The problem is that you don't just have 1 knot difference. You may have a little more than that. Then it becomes harder to evaluate.

If, on the other hand, you had a 10 knot difference, then there would be no question. You would say that submarine won't be capable. We are in a gray area where one has to balance effectiveness and safety of these submarines, in a frontline operation. They are frontline submarines equipped to go anywhere and do anything. They are not used in special or limited work. The point is that in those circumstances, the question is how much is the extra speed worth? The Navy is continuing to work on this. If you can find a way by using the best technology that we have and by being clever in design, not just doing what we have been doing, but using innovative technology which has been developed over the years by the Navy, you can recover most of the

speed difference and still end up with a submarine that cost less. Then I think that you would have to agree that we would be very hard pressed to insist that we don't want to save 20, 25 or 30 percent because we want the extra 1 knot, or whatever it may be.

The point is that you have to make that kind of a value judgment or tradeoff on how many more submarines the 1 or 2 knots is worth. That is what it really boils down to. There has never been, and there isn't any question now that more speed is desirable, other things being equal.

In regard to the Soviet threat you mentioned, I could comment on that matter further in executive session.

Mr. SPENCE. Thank you.

Dr. MANN. Let me say that the key issue again is not so much matching their speed with our speed, but having superior combat equipment and being quiet so that we can hear him before he hears us.

Mr. SPENCE. I don't want to monopolize this, but the point I want to make is that right now I would not swap ours for theirs. I think we have the advantage in many areas. You mentioned quietness and our other abilities and weapons, and all the rest.

Dr. MANN. Yes.

Mr. SPENCE. But, you see, we are heading in another direction, it seems to me. They are heading in our direction. They are trying to get quieter. They are doing this. They are now attaining more speed. They are perfecting a titanium hull to have more capable submarines. They are heading in that direction.

We, in an effort to try to get numbers and less cost, will head in a less capable direction. That is what concerns me. We have to sacrifice more than just speed if we start getting cheap.

Now, you mentioned safety, but something has to give besides the size of the submarine. If we get the cheaper submarine, that still doesn't mean that we will have the will to produce cheaper, less capable submarines. So, this is all tied together again.

Dr. MANN. Thank you.

Mr. SPENCE. I want to thank you, Dr. Mann, for being here.

Dr. MANN. Yes, sir.

Mr. SPENCE. Mr. Chairman, I will let somebody else talk at this time.

Mr. BENNETT. Yes.

Mr. MOLLOHAN. Mr. Chairman.

Mr. BENNETT. Mr. Mollohan has some questions to ask of you, Dr. Mann.

Mr. MOLLOHAN. Mr. Secretary, let me say in this first hour here you have given us a great deal of food for thought. I share Mr. Spence's great concern with what you are proposing here. I've always looked upon research and engineering departments as being vehicles which we use to develop new technologies and advanced capabilities and the introduction of new systems and utilization of new systems. It seems to me that what we have in the three categories in which you could increase your building rate and number of new attack submarines is that you have opted for one which has emphasis on developing the basis for trade-offs between potential cost savings and operational effectiveness.

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Then, also, of equal concern to me on the next page is where you say if the new class were to become operational in 1989 or 1990, that it was clear that only proven and state-of-the-art technology and propulsion systems could be considered.

Dr. MANN. Yes.

Mr. MOLLOHAN. To me, we are going to use the technology of the 1970's in developing our submarine capability for that submarine class for the early 1990's. Mr. Spence very well covered this. I see no reason to repeat it. I would suggest to you that now is a time when our people are more aware of this. When we find one of their satellites spread out all over the world in countries with political unrest and revolution, then our people are becoming more conscious of what the threat is.

Dr. MANN. Yes.

Mr. MOLLOHAN. Here we have proposed a 3-percent increase over inflation, a real increase in our military spending for the coming year and a 5-percent increase for the 2 years coming ahead of that down the road, then it seems to me that this is a program of regression and certainly not one of progression.

I don't see how we can afford to compromise anything insofar as the operational effectiveness of any of our weapons systems or any of our ships or whatever we may be developing, whether it is a tank or a submarine or a *Nimitz* class carrier. Now I frankly am shocked at this presentation and at suggestions being made in it. Now I have no questions.

Mr. BENNETT. Mr. Trible?

Mr. TRIBLE. Thank you.

First, let me say that I welcome the study, although I am concerned about where it might lead you. In an article I wrote for Seapower magazine prior to the initiation of the study, I suggested you would have to study options of the future and not be wedded blindly to the past practices, so I think it is a healthy undertaking. I am pleased that the Navy saw fit to undertake the study.

However, I am somewhat concerned about what might be done with it. I base that concern on the conduct of the administration in national defense in the area of naval shipbuilding. How many 688's are built or authorized for fiscal year 1979?

Dr. MANN. How many?

Mr. TRIBLE. Yes.

Dr. MANN. Thirty-three, I believe.

Mr. TRIBLE. Thirty-three?

Dr. MANN. Yes.

Mr. TRIBLE. Thirty-three, 688 *Los Angeles* class submarines?

Dr. MANN. Yes.

Mr. TRIBLE. Thank you.

The question must be asked and has been asked where are we in the decisionmaking process regarding implementation of submarine options? Did I understand you to say, Mr. Secretary, its anticipated proposals for submarine options would be presented in 1983?

Dr. MANN. Let me try to outline for you as best I can where the process stands at the present time. We have, without specifying the exact nature of the recommended ships, plans for going to authoriza-

tion in 1983 with SSN–X the exact nature of which is yet to be decided. We have requested funds in the budget in 1980 through the successive years to authorization. We have to complete the various studies and designs that will be involved. This is irrespective of which ship is going to be proposed in 1983. 1983 is the target year when we would come forward to the Congress with the details from preliminary and contract design for a particular submarine.

It may be a block change to a 688. It also might end up being another submarine. However, at the present time there is being carried on in parallel under the auspices of the CNO a number of studies that are examining several of the options that I've already alluded to.

We are looking at a smaller submarine which takes advantage of many of the designers' options in new technology in shape and design. This should achieve for a plant currently used in the 637 class a considerable increase in speed over the 637, and though not quite up to the 688, certainly getting close.

In addition to looking at that, OPNAV is looking at what this means in effectiveness. I think it's very important to stress because of the comments made that there is no intention on the part of the Navy to settle for a second-best condition.

Now, if any of the submariners responsible for the conduct of their operations and the safety of their men and ships felt the submarines were being placed at risk because they were much less effective, I don't think any of them would agree to this. So the question is not black and white. It is not that simple. In any event, as these studies are conducted, a very detailed engineering design study takes place. They are going to be briefed to and discussed with the CNO and other members of OPNAV and with some of us at some point, and I'm not sure exactly at what point a recommendation, if not a final decision, will be made.

Above all, there is the concern that all of us have over finding ways of maintaining our force structure. At the present rate there is no way we can do it.

Mr. TRIBLE. I would hope you expedite that decisionmaking process. That study will be used as an excuse not to build a 688 submarine.

Mr. BENNETT. In view of the fact of what you just said and we want to be able to get more reasonable production per year, but if you went to the submarine you are talking about, how many submarines would we be buying?

Dr. MANN. That is a very important and good point. It is one that obviously concerns us. Let me answer this in three parts.

In the first place, we have to make some assumptions and also projections for not only the size of the shipbuilding budget but also that fraction of it that is allocated to attack submarine construction purposes. Now in this connection there is a number of points that need to be settled. First, if there is a new class of submarine that is bound to be operationally sufficiently effective or adequate to warrant consideration, then how much money will it save? Or to put it another way, where would be the breakpoint if one continued to build 688's, or whatever the new class is? If one believes the numbers, the round numbers, roughly, the savings might be, say, of the order of 25 or maybe 30 percent. If one believes that and that has not been settled.

so this is speculative, the breakpoint would probably come around the fifth or so submarine. The question is how many would we be in a position to buy.

Mr. BENNETT. That's what I wanted to know.

Dr. MANN. The question is one of rate and priorities within the shipbuilding program and the size of the shipbuilding budget. One could buy 1⅓ submarines if one were to find the new alternatives to be adequate.

That is not a decision that I am attempting to make. It has not been made.

Mr. BENNETT. In simple terms, if we are now buying 1 per year, how many more would we be getting faster? Would we be getting 1⅓ more per year? Would it be 2⅓? Or did I misunderstand your figures?

Dr. MANN. If the saving is of the order of one-third of so——

Mr. BENNETT. I'm assuming that—assuming you save 25 or 30 percent, I am asking you and assuming you can buy at the same rate we can buy now, as far as dollars, then instead of buying one sub a year, how many could we buy a year?

Dr. MANN. If we had no more dollars, we could buy 1⅓ or possibly 1½.

Mr. BENNETT. Over and above the one we would get. It is 2⅓?

Dr. MANN. No.

Mr. BENNETT. Every third year we would get another sub, that's what I want to find out.

Mr. TRIBLE. Have you given some thought to the concept of reengineering the 688?

Dr. MANN. That should be in closed session. I think it would be better addressed to Admiral Griffiths or Admiral Webber. We considered a reengineered 688 in this study, but there are two different ways of talking about it and it is important to distinguish among them. One would reengineer the 688 for reduced cost. That is something that we did not, as I already indicated, feel that we were in a position to get into in detail. We were not in a position to work with the shipbuilders on a day-to-day basis to try to find ways in detail to do this.

That, however, is something that is being done by the Naval Systems Command. There is another use of the term "reengineered" 688 having to do with improving its capability in terms of combat equipment. Now we did consider some aspects of this in our study. One of the alternatives allowed for some improvement in the 688 class, the basic 688. So in effect it is a 688 that costs about as much as the present one but has slightly improved characteristics when talking about some of the options toward which we are looking. All of those are being looked at. I think there is a very conscious and determined view on the part of the CNO not to use this as an excuse for delaying or deferring but really to come to grips with the problem of how we will increase numbers, and also to have available to us the fullest spectrum of options: smaller submarines, same size, cheaper submarines of the same size, and more effective submarines of the same size.

What our study looked at was ways of relating decreasing size to effectiveness and trying to determine the measure on the margin. The final effectiveness judgments will have to be made by the operational community.

Mr. TRIBLE. You talked about the rate of procurement. That's a great concern to us. We are procuring one 688 submarine a year, pursuant to the request of the administration. We need three and a half or four a year to attain or sustain minimum force requirements mandated by national defense.

Now to that question I am intrigued by your statement on page 5 that the key to confidence and projections based on such estimates is a smooth, well-planned production schedule that allows for continuing competition and efficient use of the available shipyard capability.

That's an intriguing statement, because it is one we have tried to stress to this administration. It is interesting that you would make that statement to this committee. Now I especially noted your ad lib that you can't stress this point enough.

I would hope—and I say this with all respect, Mr. Secretary—that you will stress this point to your colleagues in the Navy Department and the Defense Department. The Carter naval shipbuilding program has been one of cutbacks, cancellations and deferrals. We have had a very erratic shipbuilding program that has driven the cost of the ships that we procured obviously. Six months ago I made the argument to the committee that we ought to buy two nuclear attack submarines. Why? Because we need at least two. Also because if we don't procure two in the next fiscal year, we may very well lose our shipbuilding base. We only have two people that build the ships. One of those is in my district, so I could be faulted for having parochial interest. The fact is that we need at least two to maintain the shipbuilding base.

Now I suggested at that time we might want to consider procuring a nonnuclear aircraft carrier as a tactical decision and procure an additional nuclear attack submarine. This committee, unfortunately, chose to disregard that suggestion and I think that although 6 months tactically that was the thing to do, thank God, events have changed dramatically. I think this administration will be forced to accept the nuclear aircraft carrier or say goodbye to the SALT treaty.

But going back to the question of nuclear attack submarines, I offered an amendment when the full committee marked up the Defense bill to add a 688 number two. That amendment was opposed by this administration, actively opposed and opposed by the leadership of the committee. It passed because all of the young members of the committee voted for it. It is now part of the shipbuilding budget.

I got a call yesterday from Graham Claytor, and he said that the Navy needs two 688's this fiscal year. They can't buy the second 688 if a nuclear aircraft carrier is procured, so we have to go for that nonnuclear carrier to get the second 688.

I asked where was he 6 months ago when I made the same argument here. We are going to go to the nuclear carrier. I would hope that the President will see fit to accept that. I only point that out as a personal testimony to show that there is absolutely no purpose and direction in the administration's naval shipbuilding program. That is indeed a primary function of the cost.

Now having made that statement, I will simply make one additional point, that is, from time to time I read—well, you have to know your enemy to defeat him and I encourage you to read what the admiral said as to the importance of speed. This most important factor in naval

warfare will grow in the days ahead, and we see that statement reflected in the Soviet shipbuilding program and what they are doing in submarines and surface ships as well. I'm concerned when we talk about the loss of speed. I recognize as a pragmatic legislator that we must deal in the real world with the fiscal constraints imposed by factors beyond our control. We have to strive to procure the best Navy possible. I hope that you and your colleagues would be sensitive to the tactical advantages of speed. This is part of your very difficult job.

One final note: As a representative of an administration that has had a disastrous naval shipbuilding program, but as such my statements are directed to the administration and not to you personally. You are a man of high quality and I appreciate your efforts on behalf of the Navy and the national defense.

With that, Mr. Chairman, I thank you for your indulgence.

Mr. BENNETT. Mrs. Byron?

Mrs. BYRON. I have no questions.

Mr. BENNETT. Mr. Emery?

Mr. EMERY. Thank you, Mr. Chairman.

I wonder if you could tell us whether or not you consulted with or considered consulting with Admiral Rickover during the examination of this option?

Dr. MANN. As a matter of fact, during the early stages of the study, the study director, Mr. Payne, paid a number of visits to Admiral Rickover's headquarters. Although he did not have the opportunity to meet with the Admiral, he met on numerous occasions with William Wegner, the Admiral's assistant. And he was assured of cooperation.

Second, in discussions within the Department, discussions I personally had, not only with the Secretary but with the Vice Chief and on occasion with the CNO——

Mr. BENNETT. May I interrupt? You are quoted in an article as saying you deliberately did not talk to Admiral Rickover at any time during the study when it was underway. The only reason I brought that up is to ask you whether it is true and also to eliminate from the record any implication that Rickover would not see you. You did say you went to see and and he didn't see you. That left the implication he didn't want to see you.

Dr. MANN. That is not true, Mr. Chairman.

Mr. BENNETT. Did he refuse to see you?

Dr. MANN. No.

Mr. BENNETT. I don't want any implication here that is erroneous. As it stood, it sounded like you had come to see Admiral Rickover and were shunted off.

Mr. EMERY. I must say you anticipated my line of questioning very well.

Mr. BENNETT. I'm sorry.

Mr. EMERY. You anticipated them very accurately. I thank the Chair.

Mr. BENNETT. Go ahead.

Mr. EMERY. At any rate, I do think that is an important question and I would like to know if you have any indication how Admiral Rickover feels about the suggestion that smaller submarines be con-

structed and if he has given you any opinions directly or indirectly with respect to the tradeoff, size and speed and depth capability, also especially the acoustic silencing question.

Dr. MANN. That is a rather long question.

Mr. EMERY. It is so long that two people have asked it. Go ahead.

Dr. MANN. In the first place, let me try to set the record straight, with regard to conversations with Admiral Rickover. I began, in response to your first question, to indicate that, from the outset of the study, the study director, Fred Payne, made a number of visits to and had conversations with Mr. Wegner who was at that time Admiral Rickover's assistant. I do not know whether an attempt was made by Mr. Payne to see the Admiral and, if so, what the consequences were. But I do know that he was given assurances by Mr. Wegner of the Admiral's cooperation. I had a number of conversations with the Vice Chief at OPNAV. It was felt by him and recommended by him to me that it would be best to allow, normal OPNAV procedures to be followed. I was assured from the very beginning, and indeed I have no reason to question at this time, that Admiral Rickover and his staff, or his team, had cooperated with us. That is, not only with the civilian component but with the uniformed component of the study team.

I would go further and say that the study simply could not have been done without the cooperation of Admiral Rickover.

Mr. EMERY. Can you amplify on how Admiral Rickover and his staff did cooperate with the study.

Dr. MANN. Mainly I would say by providing through the Naval Sea Systems Command to the study much of the technical information that was employed. I think in that regard it would probably be more useful to you to address that question, if not to Admiral Griffiths, perhaps to Admiral Webber, because Admiral Webber, along with a number of other individuals within the Naval Sea Systems Command, were, in fact, the people charged to supply the necessary technical and cost data. Much of that clearly was under Admiral Rickover's purview. Either implicitly or explicitly he provided a great deal of the information.

Mr. EMERY. I guess what I'm curious about—it is highly unusual for any submarine program to be discussed that it would not engage the active interest of Admiral Rickover and his staff. I find it a little unusual that he did not serve on the panel and advisory committee. You can't present us today a picture of a much more active and interested person than Admiral Rickover. It seems a little unusual and I wonder if you can tell us if there was or why there was apparently an attempt to downplay his involvement in the study. It appears that way to me without reflecting on the merits one way or the other. There may in fact be a gap in the study.

Dr. MANN. There was no attempt made to exclude him. When the study was being performed and the study groups were formed and the various advisory groups were being assembled or identified, this was not done by me or out of sight of other people. It was done in concert with representatives of the CNO and OPNAV. There was every opportunity for the Admiral himself, for example, to indicate his desire to participate. No such indication came forward. We had no particu-

larly strong views on the subject because from our point of view the only point at issue was all of the information that was going to be needed by the study going to be forthcoming. That, I felt, was a sufficient basis for proceeding.

Mr. EMERY. I have a couple of technical questions. If the answers are classified, I can pursue those in executive session later or possibly with naval witnesses that may appear tomorrow or on subsequent dates.

Dr. MANN. Yes.

Mr. EMERY. You mentioned that there would be a sacrifice in speed in the reduction of the reactor size and shaft size going along with a small size submarine. How does the small size affect the quiet speed and the operating depth?

Dr. MANN. Let me ask the chairman to let us go into executive session and I can address those quite specifically.

Mr. BENNETT. I think that is appropriate.

Mr. EMERY. I will defer the rest of my questions until we go into executive session, but I would like to ask that we ask Admiral Rickover to come here and express his views.

Mr. BENNETT. Yes.

Mr. EMERY. Thank you.

Mr. BENNETT. Go ahead

Mr. DOUGHERTY. Thank you, Mr. Chairman.

Now reduction in cost you said is tied into reduction in tonnage. Reduction in tonnage is directly related to the state of the art. You stated in your testimony that we must use basically todays state of the art.

The question I have is the state of the art, if it is such that we can do it, why haven't we done it before now?

Dr. MANN. That's not only a difficult but a very appropriate and good question that might well be addressed to all of the witnesses.

Mr. DOUGHERTY. I will ask all of the witnesses the same question.

Dr. MANN. The state of the art in the first place refers to the best available today. Some of the equipment that we have chosen to employ in our candidates and which in fact are being considered in the fleet attack submarine study have only completed testing within the past year. They have been under development for a number of years. For example, a low speed drive system provides for higher propeller efficiency, and a quieter operation has been under development for a number of years in Philadelphia. It has completed testing successfully only within the past year.

To look retrospectively, at the design of, for example, the 688 class, there is a fair amount of technology that has been developed since that class was in fact authorized and the basic designs chosen.

Mr. DOUGHERTY. But to take your statement, has that technology been actually employed in real situations? You have it in a laboratory situation. Have you ever had it aboard ship? I am in an area I am totally unfamiliar with when you talk about the technology. To me state of the art means something that has been road tested, that we know will work in a live situation, rather than a lab situation.

What I'm saying to you is are we going to come up with what we think works in that lab if a driveshaft is slower and put it in a sub and find it doesn't work.

Dr. MANN. No; I again would like to defer a more detailed discussion on this to Admiral Webber.

Mr. DOUGHERTY. Yes.

Dr. MANN. It is my understanding that the testing that has been done that it has been about as realistic as it can possibly be and that no proposal or suggestion along this line would be made or would be considered by the Naval Sea Systems Command, if they didn't feel it was a low-risk, high-confidence opportunity.

Mr. DOUGHERTY. My problem is you've had the problem with *Saratoga*. One of the big problems there was it was such a poor aircraft carrier because she was a prototype with a lot of great designs and when they were put on the ship, it didn't work. We spent the last 20 years trying to make something work that we did not have in place. Obviously, you're talking about a smaller sub. Is it safe to say with a smaller sub you are going to get reduced speed, reduced vector, and reduced weaponry?

Dr. MANN. No; the stipulation was at the very outset that we would have the same weapons load out as in the case of the 637 and the 688, if not greater.

Second, the combat suite, to all intents and purposes, would be identical with what is either on board right now in the case of the 688 or in some instances backfitted into the 637.

Mr. DOUGHERTY. For the record, let's be specific. The SSN–X will not have reduced weapons capability over the 688?

Dr. MANN. No; it would not.

Mr. DOUGHERTY. We have stressed quietness. What happens after it fires its weapons, particularly at a naval task force on the surface, if it can't go as fast as the enemy submarine and it can't dive quite as deep as the enemy submarine, what happens after it has had its day in the arena?

Dr. MANN. In the first place, it doesn't follow that when the submarine has fired its weapon that it is necessarily heard or, even if heard, that the adversary or enemy force will know precisely where the weapon was fired from and be able to launch a weapon to that particular location. I would suggest, Mr. Dougherty, that I would return to that question, if I may, in closed session rather than open.

Mr. DOUGHERTY. Thank you.

The next question deals with—you talk about quietness and sensors. How long do you think it will be before the Russians develop a quiet submarine?

Dr. MANN. In a relative or absolute sense?

Mr. DOUGHERTY. We are told—we never knew they could make a ship out of titanium so we presumed there would never be a titanium submarine. So we had done no research. That's what was testified to. We were completely—well, it's another Sputnik type. Now maybe in closed session you may change that, but the testimony I recall is that it was a complete surprise to us. The Russians developed a titanium submarine. The presumption here is that while we will always have a quieter submarine—the presumption is that the Russians will never develop a submarine more quiet than ours and the Russians will not develop a sensor that can pick up other very quiet submarines. I guess I am now questioning presumptions made about what the

Russians are going to do and not do in relationship to the fact that they were not going to make a titanium submarine. All of a sudden, they did.

Dr. MANN. Again, I can comment on all points you have mentioned in executive session much more easily than by talking around them in open session.

Mr. BENNETT. Before we go into executive session, Dr. Mann, one thing I wanted to ask. I asked you one question, or said something about building one submarine every third year. It is really every fourth year that you might add a submarine, isn't it?

Dr. MANN. It depends on the size of the saving.

Mr. BENNETT. It isn't every third year. It's every fourth year. Somebody corrected my statistics on that. I wanted it clear.

Dr. MANN. On the other hand, Mr. Chairman, it is also clear that if, during the earlier period, some of the Navy's other priorities begin to be met, one would like to look forward to an accelerated rate which, simply because the submarine is less expensive, it could be accelerated more than in the case of the 688 class.

Mr. BENNETT. We've been through that. They were going to give us a little cheap carrier. We were going to have five of them and we wound up having one between now and the year 2000. That is an optimism that is not shared with reality.

We now will go into executive session. We have 15 minutes before the bells.

Dr. MANN. Yes, sir.

[Whereupon, at 11:45 a.m., the subcommittee went into executive session.]

Mr. BENNETT. The subcommittee will come to order. Proceed, Dr. Mann.

Dr. MANN. I can't tell you how grateful I am that you had not asked me to testify on carrier construction.

Now, for reference purposes, let us take as given the 33, 34, or 36 or 37 of the 688's that we would have, if, in fact, we went up to fiscal year 1983 with 688's and then began with a reengineered 688 or fleet attack submarine. The 688 availability curve would have leveled off at, say, 36 or 37, but the point that has been made so many times is that the longer term force structure situation is unsatisfactory. We recognize this. That is the underlying motivation for finding some alternative approach to having to depend on major increase in the building program of the 688's.

Mr. BENNETT. It is not just a question at this time of keeping two yards open, but a question of having a serious depletion in the number of SSN's.

Dr. MANN. Absolutely.

Now, in response to Mr. Trible's remarks, it has certainly become apparent to everyone that there is money to be made, so to speak, as well as national security reasons, for keeping the two yards occupied.

Mr. BENNETT. You mean that we will get them cheaper if we have a continuing flow. You didn't mean because some corporate structure had money.

Dr. MANN. No. I spoke in a colloquial sense; they would be cheaper, Mr. Chairman.

Mr. BENNETT. I wanted the record clear on that.

Dr. MANN. Let me show some of the characteristics. We have talked a good deal around them. I will draw your attention to the material in the outlined portions. I don't intend to go through every one. Let me discuss or describe them to you in classes. Then I will get back to Mr. Emery's question and Mr. Dougherty's questions.

Mr. BENNETT. Yes.

Dr. MANN. The principal candidates are, in a sense, limited, as I said before by the 637 class at one end and the current 688 class at the other end. Some of the variations in between are reflected here, and are mainly of two or three kinds. In this area we have considered the possibility of greatly increasing the weapons load and making some changes with respect to propulsion through the use of already developed propulsion systems: This is [deleted] that was developed some years ago by Admiral Rickover [deleted] pressurized waterplant employed in the 637 class.

[Deleted.]

As I indicated before, [deleted] system had been developed over a period of years. It has been rather fully tested, however, I would like to defer any specific engineering questions that you have on this to tomorrow for Admiral Griffiths or Admiral Webber, as the case may be.

There is very little question in my mind that this is a low-risk undertaking. That view is based on the assurances from NAVSEA that this is the case. Beyond that, I have to defer to Admiral Webber for elaboration.

Now, in any case, the point is we have considered a number of options that make use of an existing [deleted] plant, the S–5–W, that is used in the 637 class. This is with a current speed drive and everything else being more or less the same. This option employs [deleted].

In all instances, again, with the same combat equipment as in the present submarine—depth capabilities, are comparable to what is specified for the 688. As you all know [deleted]. You would have the same [deleted] as the 637 class.

When one looks through all of these possibilities, you find that you go from about not quite 5,000 tons in the 637 to almost [deleted] when you go to the [deleted] type of system, because the reactor itself is larger and a larger hull is needed. At the high end the option is up to something that, for all intents and purposes, is a kind of 688. So the systems are bracketed.

Another range of alternatives considered and important for present discussion are those that left the weapons load where it is today on both the 688 and 637 classes. They employ the maximum quieting that we felt that we could envision [deleted] and the various other design features. Then we would consider the S–5–W plant used in the 637 class [deleted].

I would like you to concentrate your attention on these two alternatives and I will make an observation. In order to avoid too many engineering changes, we used the same hull forms and shapes, basically that are contemporary on the 637 or 688 classes. We did not attempt to go into any new kinds of shapes. All that we concentrated on were

either shrinkage which involved using an existing [deleted] reactor and a [deleted] drive or a variation in the type of reactor employed.

Mr. BENNETT. Would the exterior size there actually be the same?

Dr. MANN. It is the shape, Mr. Chairman, not size.

Mr. BENNETT. What would be smaller?

Dr. MANN. [Deleted], as you can see, it is [deleted] compared to 360 feet for the 688.

Mr. BENNETT. Yes.

Dr. MANN. It is somewhat longer than the 300 feet or so for the long hull 637 class. It is a lot closer in size to the 637 and a fair amount shorter than the 699, but with the basic same hull form.

Mr. BENNETT. Thank you.

Dr. MANN. The point of interest, and I will try to get through this rather quickly, but one of the conclusions of the study which had a good deal to do with the initiation of the Naval Sea Systems Command fleet attack submarines study is manifested in these two columns. This is the 1–A and the 2–A alternatives. They are distinguished principally by the pressurized plant, the S–5–W (637 plant) for the 1–A, [deleted]. This is for [deleted] efficiency.

The [deleted] plant [deleted] represents the other, the 2–A. The use of a larger reactor for [deleted] and a somewhat longer one; also, [deleted]. Again, if you recall, the 688 class is capable [deleted] maximum. The normal 637 class [deleted] maximum. I should specify that this is for a ship-in-use situation not with a defouled freshly painted clean hull just out of the shipyard. You have [deleted] at one extreme, [deleted] in the middle and [deleted] at the 688. That's the actual bracketing.

Now, based on the costing that I have already described to you in some detail, we estimate this smaller [deleted] ton version would come in with follow-ship cost of about 65 percent of the cost of the 688. [Deleted.]

That is a 637 revisited in new clothing [deleted]. The 637, after all, is an 18- or 20-year-old ship.

Then we looked at the [deleted] version [deleted]. It comes in at 15 percent or 16 percent less than the 688, which, from a cost standpoint, doesn't look all that attractive at this time. [Deleted.]

Now, these, Mr. Chairman, are the results that we had essentially last December. We looked at these and at that point I had a private meeting with Admiral Long, the Vice Chief, and I pointed out what these results showed. If you wanted to sav 30 or 25 percent, the way that we did it, then you ended up with a ship—well, on the face of it—of insufficient effectiveness. [Deleted.]

If, on the other hand, you went [deleted], which would make for an effective ship, given the acoustics and weapons capability that it would have, it ended up saving only 15 percent. That was not enough. The question was, is there something that the Navy can do when it puts its own design team on the problem? The answer came out last December. The CNO issued a directive to Admiral Whittle saying that as a matter of the highest priority, a design study aimed at exploring the capabilities and costs of a submarine not to exceed 5,000 tons was to be undertaken. A copy of the CNO's directive, to Admiral

Whittle is available to you in the report. This relates to the cost projections and capabilities, as I already implied, Mr. Chairman, in the earlier viewgraphs the performance for the new design would be comparable to no worse than case, and better, if possible, than that for 637, and in some cases, 688. [Deleted.] That study has been underway for some 9 months. It has led in a preliminary way to some very encouraging results. They have not as yet been formalized in a final briefing to the CNO. I don't want to go into details, but it would suffice to say qualitatively that what the study appears to show is that you have, or can have, about this kind of savings in cost with this kind of performance when you make certain changes in basic design. One of the key changes is the hull form. They changed the shape of the hull to make it more efficient. They also made other changes in engineering, which, in their view, are fairly high-confidence changes.

By using all of the design developments in the technology community and the submarine design community over the last several years and bringing them to bear on this issue, they have been able to get this kind of cost savings with this kind of performance. Those results are not firm or final, but all the indications point in that direction.

So, in this context, Mr. Chairman, what this study has done is to point out that, unless one goes beyond what we were able to do, you can either save money but end up with a submarine that is not really terribly exciting from an effectiveness standpoint, or you end up with an interesting submarine that doesn't save you very much money. Our hope was you can combine the two.

Mr. BENNETT. Before we went into executive session, Mr. Emery had a question.

Mr. EMERY. I wanted to get into a technical question. You indicated you would rather defer those until tomorrow.

Dr. MANN. Yes.

Mr. EMERY. But I would like to ask you a general question now.

This relates to the tradeoffs and operating depths and the maximum quiet speed and whatnot.

Dr. MANN. Yes.

Mr. EMERY. Also the performance characteristics and the smaller size and low cost.

Dr. MANN. In an accurate, but admittedly somewhat gross way, habitability is not significantly different from, or any worse than the case of the 637. Access or engineering space availability is not a problem. Depth capability, as I already pointed out, [deleted].

Mr. EMERY. What impediments are there to the increasing of the depth capability from an engineering point of view? The hull diameter is smaller. It is generally able to withstand greater depth.

Dr. MANN. In the first place, I had not specified the hull diameter is any smaller. The hull diameter in all of these cases is exactly the same. That's what I meant when I said to use the same hull form. It is 33 feet.

Mr. EMERY. Thank you.

Dr. MANN. The new design would make use of an expanded hull form, a slightly different one. From that standpoint, if you want to

go deeper, you have to have thicker hull materials and more weight for, essentially, an otherwise similar submarine.

Mr. EMERY. Unless you have a superior alloy.

Dr. MANN. Yes.

Mr. EMERY. One of the things that I want to hear something about is, or that has been bothering us over the past few weeks as we looked at the redesign, is the Soviets seem to be improving their depth capability and their operating speed. Their speeds tend to exceed ours. Our concern is to determine whether that is important or not. I tend to think that they have a greater depth capability and speed. We need this for our submarines to avoid detection and possibly also outrun weapons. We should take advantage of those characteristics. I would like to see in a new submarine in the classes we develop that we at least consider the possibility we may wish to improve on those characteristics, among others.

I wonder if you could reflect on the ability to add a knot or a fraction of a knot to the speed and maybe a couple of hundred feet depth. This is with that capability without seriously destroying the cost figures or making other fundamental changes in design that may not be advantageous to what it is that you are trying to do.

Dr. MANN. Let us take up speed first.

Mr. EMERY. Yes.

Dr. MANN. I will leave it to the operational community or those people to comment from their experience on how they would regard the issue of depth.

As a general point, there is no question more performance in any, almost any, dimension is likely to be advantageous in some respects or, at least, at some times in having more depth capability. That is undoubtedly useful. The specifications, including the 688 class, reflect the views of the submarine operational community.

Mr. EMERY. They represent a tradeoff probably between cost and technology. You probably could design a submarine that could go down 5,000 feet but you might only be able to put one person in it. That's what I want to get at. What do you think about that as to a small submarine?

Dr. MANN. As a general comment, I would say, from our point of view [deleted]. It does not seem to be a major or dominating consideration, in our view, of what a new submarine should have, either an existing submarine, a modified one, or others. If we could have it all, the thing that we would go after, the thing that our R. & D. programs collectively are attempting to pursue right now [deleted].

The issue there, and this goes back to a point that Mr. Dougherty made, isn't that you cannot ever be heard. The issue is this. Can he hear you early enough with his equipment if he is using the kind of equipment we have on the 688, including the long-towed array. The point is, if we are quiet, there is nothing that he can do to detect us until we get in fairly close. Our problem is, as long as there is some imbalance in radiated noise characteristics in his sub versus ours, we want to hear him before he hears us. We always want this. In any event, to get back to the key points, the quieting issue is a major one. I won't talk about the communications issue because I think that

would probably consume the rest of the week if we got off onto things like that. What is important is to take advantage of our quieting and our superior sensor and sensor-associated processing capability to employ standoff. This implies, for example, being able to do not only more distant detection to hear him before he hears us, but to be able to do much more rapid localization so we can do a target motion analysis and get a fire control solution, get a weapon off or be in a position to do it. This would be well before he has a chance to escape or for us to then run the risk of being heard.

It gets back to quietness. I don't want to sound like a submarine driver in disguise, but the submariners who currently have to employ a good deal of manual intervention in order to get the proper kind of target motion analysis and localization information, they have to spend a fair amount of time moving around trying to obtain adequate bearings and bearing rates to triangulate the opponent. Frequently, this also requires them to come in closer than is desirable.

So, a good deal of our effort is devoted partly to trying to automate the process, something which is difficult but not impossible. Also it is mainly to be able to improve our sensors to the point where we can employ them faster and at greater distances, given that we have that capability and we have a fair amount of it today.

The next issue is the range of weapons. A key consideration for the future, from our point of view under any set of conditions, is an adequate standoff weapon. That would allow us to take advantage of our superior sensors and superior quieting and be able to hear him and track him. We can then target and fire at him before he knows we are there.

There is another issue that was brought up earlier by Mr. Dougherty that has to do with what happens after you fire the weapon. There are tactics that have been developed over many years on what you do after you have fired a weapon. This is for evasion.

In the case of a torpedo, for example, something that gets to be pretty noisy when it gets close to the opponent or adversary, tests have shown—and there have been perhaps 100 tests of this kind done in the Bahamas—that only in a very few cases has the first shot been heard until the torpedo was enabled during its final approach. I had forgotten what the exact percentage was; it is a few percent.

Mr. BENNETT. Mr. Emery.

Mr. EMERY. You are saying we have consciously made the effort to quiet our submarines and develop acoustic capability that has resulted in some tradeoff on speed and depth.

Dr. MANN. I think to a degree that is true. One has to make trades in any engineering problem. It is clear you can't have everything in one system at affordable cost and complexity.

Mr. EMERY. I guess as my final comment, I agree with developing the acoustic technology. I believe probably the ability to run quietly and detect the enemy before he can detect us is probably one of the most valuable advantages to be developed.

At the same time, I think we can't ignore some of the more basic things. I am concerned about speed, depth, and I don't think we ought to assume, merely because we have the other technology, that (a) the

Soviets will not catch up to us or, (b) that we are always going to be able to outmaneuver or outthink them if we have a slower speed.

Mr. BENNETT. I think that we had better adjourn.

Mr. EMERY. Thank you, Mr. Chairman.

Dr. MANN. Thank you.

Mr. BENNETT. We will try to come back at 10 o'clock tomorrow. Mr. Hale will be in touch with you if you cannot come back. We are running competition with a conference in the House and Senate. We are adjourned.

[Whereupon, at 12:15 p.m., the subcommittee adjourned.]

HOUSE OF REPRESENTATIVES,
COMMITTEE ON ARMED SERVICES,
SEAPOWER AND STRATEGIC AND
CRITICAL MATERIALS SUBCOMMITTEE,
Washington, D.C., Thursday, October 11, 1979.

The subcommittee met, pursuant to recess, at 10:17 a.m., in room 2216, Rayburn House Building, Hon. Charles E. Bennett (chairman of the subcommittee), presiding.

Mr. BENNETT. The subcommittee will come to order.

Dr. Mann, we are pleased to have you back again to continue your testimony on the Submarine Alternative Study. During your last appearance you covered the key factors relating to cost in the building of submarines which concluded that cost was mostly related to submarine weight.

This morning we hope you will provide us with your views on the findings and conclusions of the study. Specifically, we are interested in how costs, both initial and life cycle, and military effectiveness relate. I must note that on page 52 of the study summary you state that on the basis of acquisition or life-cycle costs, the higher quiet speed submarines are more cost effective at all ranges from base under flexible employment conditions and are also more cost effective on a life-cycle cost under static employment conditions.

With this conclusion it is somewhat confusing as to why the Navy is considering slower submarines. Perhaps your testimony today will help the subcommittee clarify this issue.

You may proceed as you wish.

STATEMENT OF HON. DAVID MANN, ASSISTANT SECRETARY OF THE NAVY FOR RESEARCH, ENGINEERING, AND SYSTEMS—Continued

Dr. MANN. Thank you, Mr. Chairman.

Let me summarize very quickly where we left off at the last hearing.

I had presented the cost information that we had acquired in the course of the study. I had shown you and the committee the basis on which we estimated that a smaller submarine could be developed that would have adequate operational effectiveness. I want to be very careful to stress that point; nearly the same operational effectiveness as the 688 in all respects except the escort of a carrier task force.

This goes to the point that you just cited with regard to cost and cost effectiveness. I think it's quite clear that there is a difference, and we don't, haven't, and wouldn't deny that there is, and undoubtedly, will continue to be some difference between the effectiveness of the 688 class and the effectiveness of whatever new class of smaller submarine is finally proposed by the Navy.

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The question before us is the magnitude of that difference in relation to the savings in cost and how that difference in effectiveness relates to the kinds of tasks that submarines are assigned.

The conclusion of the report is that a smaller submarine, which can be built for about 30 percent less than the 688 class and which would have a maximum speed about halfway between the 637 class (*Sturgeon* class) and the 688 class (*Los Angeles* class) would come very close to matching the 688 in tasks other than the escort of a high speed carrier task force.

That was the point where we had to break last time, and what I would like to do today is to proceed to describe these tasks and give you a summary of effectiveness. From that point, we can then discuss cost effectiveness, life-cycle cost, and anything else the committee may wish to discuss.

Much of what I have to show, and, in fact, the very first viewgraph, is classified.

Mr. BENNETT. We can go into executive session whenever you want to.

Dr. MANN. I would prefer to do it now, and then we can drop out of it if you so desire when we get into more general questions. But, I would like to get on to the effectiveness discussions as quickly as possible.

Mr. BENNETT. All right. Without objection, we'll go into executive session.

[Whereupon, at 10:23 a.m., the subcommittee recessed, to reconvene in executive session.]

Mr. BENNETT. Go ahead, Dr. Mann.

[Viewgraph shown.]

Dr. MANN. At our last hearing I showed this first viewgraph, and I'll put it on merely to recall the alternatives in relation to the cost savings that we estimated, as well as in relation to the one parameter which most affects the estimated effectiveness of the candidates.

The two alternatives were the so-called 1–A, which is in a sense a *Sturgeon* class updated and improved, with a maximum speed [deleted], just like the current 637 class, and which we estimated could be built for about 35 percent less than the current 688. The second alternative is the so-called [deleted], which we estimated would have a maximum speed [deleted], but which would save only about 15 or 16 percent.

I made the observation last time that when we recognized that we could build an appreciably less effective submarine with considerable saving, or a really quite effective submarine but with only a very modest saving, that I approached the then Vice Chief, Admiral Long. We discussed the need for the Navy's hull design team, headed by Adm. Jim Webber, to tackle the problem of seeing if we could reduce cost and improve effectiveness, and it is on that basis over the past 9 or 10 months that they have continued their analysis of the so-called fleet attack submarine. That study is on the verge of completion.

The upshot of their study in approximate form would lead to the saving of the order of 30 percent or so. The final numbers are not in, but it's of that order, at a maximum speed [deleted]. So in a sense, it combines the saving from the 637 type and the capabilities that are inherent in our original estimate of the so-called [deleted] version.

On that basis, then, everything that I will now describe to you is in the context of these alternatives and candidates from within our own study. The one that comes closest to the fleet attack submarine in most regards is the so-called 2–A, or [deleted] alternative. That alternative would allow for a saving of the order of 30 percent.

Mr. BENNETT. Its speed is what?

Dr. MANN. [Deleted], and that's probably a pretty good guess as to the outcome of the fleet attack submarine study. But I don't want to preempt Admiral Webber's report because it hasn't yet been formally issued or, for that matter, accepted by the CNO, and one must recognize that there may be some further changes. However, [deleted] is probably a pretty good estimate of the speed.

Mr. BENNETT. Then that's just a little less than what they'd be pursuing, right? They'd be pursuing [deleted]. It that right?

Dr. MANN. The original tasking memorandum from the CNO specified a minimum [deleted], with a goal [deleted], and at the present time, they seem to be in the vicinity [deleted].

Mr. BENNETT. Won't they be chasing subs [deleted]?

Dr. MANN. Pardon me?

Mr. BENNETT. Won't they be chasing subs [deleted]?

Dr. MANN. There may be some circumstances where that would be the case.

Mr. BENNETT. And don't they have to stop to listen?

Dr. MANN. Yes. They have to slow down.

Mr. BENNETT. Then you'd have to have a little luck on your side to be very effective, wouldn't you?

Dr. MANN. I would like, Mr. Chairman, to defer a detailed discussion on our operations. I'm sure Admiral Griffiths and Admiral Burkhardt can do that.

Mr. BENNETT. All right. Excuse me. I won't ask any more questions.

Mr. MOLLOHAN. Let me ask one question while you change your slides.

Dr. MANN. Surely.

Mr. MOLLOHAN. What is the speed of the 688?

Dr. MANN. [Deleted.]

[Next viewgraph shown.]

Dr. MANN. The purpose of this viewgraph is to call to your attention the typical locations of war patrol stations that the submarines would be called upon to occupy. Some of them, for example, [deleted] may be as much as 7,000 miles away from the United States. Others, [deleted] three or so thousand miles from the United States. Some of the others [deleted] may be of the order of 4,000 miles from the United States.

The point is that there are a good many postulated locations scattered in terms of their distance from the United States. One of the key advantages of high speed, high quiet speed or flank or maximum speed, is the rapidity with which a submarine can be deployed to considerable distances.

On the other hand, recognize that the normal submarine patrol will consist of about 60 days on patrol, 30 days or so for upkeep. Of that 60 days, in the case of, say, a transit [deleted], is likely to involve a difference of no more than perhaps 2 days or 3 days between the slowest of our present submarines and the fastest of our submarines. Con-

sequently, the impact on the number of days actually on patrol, is likely to be of the order of 2 percent, out of 60 days total, perhaps a maximum variation of 2 or 3 days. For more distant transits [deleted] the difference might be of the order of 5 or 6 days.

[Next viewgraph shown.]

Dr. MANN. These are the typical submarine missions or tasks, again setting aside the escort of very high speed carrier task force, for which the 688 class is clearly the best suited. At the very outset, we recognized that there would ultimately be a sufficient number of 688-class submarines to provide that kind of escort capability, and so we simply said, "We're not even going to consider new submarines in this context." There are enough—it would be nice to have more—but there are enough to take care of our 12 carriers.

The candidates were compared in relation to the fixed barrier, moving barrier, area clearance, vectored intercept, and also antisurface ship operations. These are the standard tasks that are normally assigned to submarines.

Using simulations and models that were developed originally by the Naval Undersea Systems Center at New London, we compared the various candidates in this mission area with a 637 at one end and the 688 at the opposite end to see where they would fall.

The fixed-barrier case allowed for a number of typical situations where a barrier [deleted] was to be patrolled by a submarine to insure that no adversary could penetrate without being detected. These penetrators, the so-called adversary submarines, were allowed to move through [deleted], and the measures were as indicated:

We considered the probability of our having a successful attack on him; his probability of successfully attacking us; and the probability total of our being able to attack him without ourselves being killed.

We also considered three standard acoustic environments. These relate to the fact that, during different seasons, the environment may be very poor and hearing may be very bad. In other circumstances hearing may be very good, hearing of both the adversary as well as ourselves, and so we've allowed for good hearing, which occurs perhaps 20 percent of the time, moderately good hearing, which occurs about 40 percent, and poor hearing which also occurs about 40 percent of the time, just to be fair in terms of distribution of circumstances in which this submarine would have to operate.

[Next viewgraph shown.]

Dr. MANN. I won't go through each of these in detail. I'll just show you one or two to give you a flavor for what's involved.

Our submarine, will patrol an area, for example in that it has to clear, to try to intercept an advanced type of Soviet submarine that may be patrolling at very slow speed in order to be very quiet and very difficult to detect. The question that we then posed to ourselves is: Can we, in fact, sweep this entire area without ourselves being detected That's the key to remaining secure. We want to operate in a covert way.

Obviously, we're successful if we can detect him and presumably get in close and kill him before he detects our presence.

All of these models and all of these simulations are of that general type.

[Next viewgraph shown.]

Dr. MANN. Another example of a quite different type is anti-surface warfare, where a body of adversary capital ships and escort ships, protected by a screen of submarines, perhaps three in number, is moving at significant speed. The question then is: Can our submarine penetrate the screen close enough to do one of two things: either to launch a Harpoon missile, say, from a range of about [deleted] miles from the target, or to come in sufficiently close, of the order of perhaps [deleted] or so, to fire a MK–48 torpedo? Those are the tasks that are employed in measuring our relative effectiveness.

[Next viewgraph shown.]

Dr. MANN. This table, which I had intended to show last time, is a summary of the results of all of these effectiveness measures and simulations.

Let me recall again that the 637 types, 1 and 1a, which vary in no great or no important respects, other than in terms of weapon loads, basically are [deleted] submarines.

The so-called [deleted] derivatives are basically [deleted] submarines. The reason it says [deleted] SSN–688" is that much of the equipment in this candidate is essentially from the 688: weapons load, combat suite, all of the equipment that would normally be used. However, the propulsion system is based on the [deleted] which is a smaller plant than is employed in the 688, and the submarine weighs about a [deleted] less than a 688.

The fleet attack submarine would weigh about [deleted] less. Thus, it would have a slightly smaller plant, the 637 plant, and it would make about the same speed. That's what I alluded to earlier. This, then, represents the nearest that this study could come to what will be coming out of the fleet attack submarine study.

Then, finally, there are derivatives of the current 688. The so-called SSN–3 is a somewhat improved 688, and the 3a is a 688 that has been as much improved as we know how at the present time, not so much in speed but in terms of quieting and combat efficiency.

Everything is referenced to a 688, which was the object, of course, of making the comparisons.

A further point that should be made is that no one claims that these numbers are any better than, say, to 10 percent; that is, 0.1. Thus, one should really not pay too much attention to the second figure. They are included here principally for statistical purposes. The uncertainties, in other words, are in the first decimal place, that is up or down by 10 percent.

If we take each one of these tasks: fixed barrier, moving barrier, area clearance, vectored intercept, [deleted]—and finally antisurface role, and compare each to what is essentially a standard 688 submarine, we see that an improved 688, particularly in those areas where quieting makes an appreciable difference, appears to be somewhat better even than the present one.

If you look at the 637 class you'll notice that, for most of these tasks, the 637 is appreciably less effective than the 688, which is to be expected.

Finally, if one looks now at the candidate based on [deleted], or then near approximation, which will be the fleet attack submarine, one notices that for most of these tasks the numbers are practically identi-

cal: 98 percent versus 100 percent or 105; 0.93 versus 1.00 or 1.04; 1.00 versus 1.00 versus 1.05. Hence, for all intents and purposes these numbers are virtually the same as these numbers (indicating on viewgraph), recalling again that the 637 is appreciably lower.

That's the basis for the statement in the report that the candidate possibilities that we've examined which would allow for a significant reduction in cost through the design of a smaller submarine, of the order of 5,000 tons or so, are for most tasks about as effective as a 688. The exception, I stress again, is in the escort role, where the 688 is clearly superior because of its much higher speed. For all intents and purposes, that really is the bottom line.

With that statement let me now show you the findings in summary form, and then I'll leave myself open to questions. If it proves possible to discuss some of these in open session, we perhaps can do so.

[Next viewgraph shown.]

Dr. MANN. First, is that all new class candidates can be brought to the same level of quietness. That's a very important point because, as I went to some pains to stress last time, the quietness of a submarine is a major factor in its effectiveness because most of the time it does not move at very high speed. What it attempts to employ is covertness and stealth, to detect and to gain a weapons launch position on the enemy without being heard so that we have the advantage of surprise. The essential point here is that the technology that is available today allows all of these candidates to be brought to the same level of quieting.

Some high mobility missions do benefit from high, maximum speed, for example, vectored intercept, where detection of an enemy is either made or suspected by some other means. Maybe we've noted his communications transmission and we have a general idea of where he is, [deleted]. The speed at which our submarine can move from where he is to where he has to go is clearly very beneficial.

The question, again, is not, "Is this a good thing or a bad thing?" The question is, "How big is the difference?" As my earlier table showed, the differences, even in the case of a vectored intercept, are not very large when the difference in speed is only of the order of [deleted] knots, but when the difference is of the order of [deleted], as between a 688 and a 637 class, then there is a significant difference in effectiveness.

Most missions benefit from a maximum quiet speed, as opposed to maximum speed. This is again a point that I mentioned earlier, and the reason for that, is a submarine does not as a rule operate at flank speed, the fastest that it can go, because it is more easily heard and detected in that circumstance. Much of the time it uses that maximum speed to get to an area, and then will move around relatively more slowly, in patroling, tracking, trailing, or in doing whatever its assignment is, if for no other reason than to avoid being heard and probably attacked.

We can expect with reasonable confidence—and this was discussed at considerable length the last time—appreciable acquisition cost savings for the smaller submarines.

Mr. BENNETT. At this point we all really will have to go and vote. But I would like to just say that we're going to try in the future not

to have a conflict like this. We may have to meet on a Monday. We have two more hearings after this. I hope all of you will come back. At this point if we don't go now we'll probably miss our vote. We'll be back.

[Whereupon, the subcommittee recessed from 10:45 a.m. until 10:58 a.m.]

Mr. BENNETT. We'll go back in session.

Dr. Mann, you were on the third point, I believe.

Dr. MANN. Yes; I had just finished saying that significant cost savings could accrue from the design and construction of the smaller submarines, that we estimate would have, essentially equivalent effectiveness to the 688. That point is summarized at the bottom of the viewgraph.

Mr. BENNETT. How about reading that?

Dr. MANN. It says that: "If at least [deleted] maximum speed, full quieting, and adequate maximum quiet speed can be achieved in a new, smaller fleet attack submarine design, significant mission effectiveness can be expected." It was with that in mind last winter that the CNO directed that the fleet attack submarine study be undertaken, and I believe that much of what I've said and what I presented last time will be borne out by the results of that study.

The only concluding remark I would make with regard to the overall findings, or outcome, of this investigation relates back to a point that you raised, Mr. Chairman, at our last meeting. That was, "If we have only a given amount of money and we save of the order of 25 or maybe 30 percent, how many more submarines could we expect to buy?" Of course, the answer is four for three. For every three 688's that we would buy, we could expect to buy four of these new ones.

On the other hand, as we all recognize, the Navy faces a growing shortfall in the outyears as the 637 class submarines are retired, and, given the one-a-year authorization rate, or building rate, for the 688 class, it's clear that we're going to have a major shortfall. The real way to look at the saving is in providing an offset, a partial offset, against an increase in allocation and an increase in building rate. Or to put it another way, if we could move to two submarines a year and we could save effectively one-third, one-quarter to one-third, on each one, the $100 or $125 million that one would save in comparison with the 688 would then, in a sense, provide a partial offset against the increase that would allow you to build two a year or maybe even three a year, as opposed to proceeding at the one-a-year rate in the case of the 688's. That would have, as Mr. Trible pointed out last time, the advantage of keeping two shipyards, our two remaining nuclear submarine capable shipyards occupied. It would represent a more efficient way of proceeding.

The whole object of the study, going back to Secretary Claytor's original task, was to see what our options are. What we've attempted to do, it not propose a particular solution as much as to expose the options and provide the Congress, OSD, and others with the insight and the data to allow for a rational decision.

My own preference, of course, would be to find some way of increasing the building rate, and to recognize that if it turned out—and I say this in full recognition of the consequences of my statement—if it were

to turn out that we could not increase our building rate, then clearly the way to go would be to build the more effective, higher performing submarine.

However, as we've said many times, we recognize that approach will leave us with a very high quality force, which is far too small for the tasks the Navy will have. Consequently, the problem is how to balance an attempt to reduce cost without giving up more than a very minimal amount of effectiveness and to try to increase the building rate to achieve or come closer to a 90-force level. That's been the purpose of the study, and I think, at least in terms of the data that we provided you and others in Congress and the Defense Department, it has been a useful effort. It leaves clear on the table, however, the message that there is no cheap solution; there is no easy solution; there is no magical way of suddenly nailing down cost while retaining effectiveness. You can save money, but you have give up something in return and the question is: "Can you afford to give up that little bit in order to save that amount of money?"

With this I would like to stop and invite your questions.

Mr. BENNETT. All right.

I would like to say that my impression has been that you've done a good job and that you should be congratulated as I now do for the thoroughness of it and for your dedication in finding the answers to these questions that were put. The questions were worthy of being asked and I think that you have done a good job as far as I can see, in getting the facts to us.

Although some of the questions that are probably going to be put to you would be directed to the last summation that you had which you really won't control; it will be a Bureau of the Budget, Presidential and congressional mix as to how much we can afford.

From what you've said to me, it would seem to me that the ideal thing would be to go ahead and produce the 90 688's at the rate that's necessary to get to the 90 fleet, and then if we could add as many as we can of these cheaper submarines, that would be the ideal situation, and that to fall back you really start getting in a quagmire because of the fact that we do need 90 and we're not even producing now to get the 90. As you say, we may have to go ahead and produce them. It depends on how important it is to have those 90, and that has to be weighed, and I'm not too sure that this committee could make that kind of a decision right now based on the basis of the information we now have.

But I do appreciate the thoroughness with which you've presented it, and I'm glad we have people like you doing these tough problems. with tl.e expertise that you have.

I have no further questions.

Mr. Spence, do you have any questions?

Mr. SPENCE. Thank you, Mr. Chairman.

The other day you mentioned, Dr. Mann, about the Navy's missions that you considered in this alternative study.

Could you list for me the types of missions that were taken into consideration in this study?

Dr. MANN. Yes, Mr. Spence.

If we could just flash that on. I think you were out a few moments ago when we displayed a list of those missions.

Mr. SPENCE. Yes, I was.

Dr. MANN. It will only take a moment to put that back on.

[Viewgraph shown.]

Dr. MANN. The five missions, or tasks, which we considered, standard tasks, are the fixed barrier case, where the submarine is directed to patrol a barrier of specific length [deleted] a moving barrier, where the submarine moves along at some rate either in advance of the task force or for some other purpose and attempts to sanitize, or clear, a particular area across some distance; area clearance, where the submarine is directed to patrol within a fairly sizable ocean area and insure that there are no enemy submarines in that area; large area of ocean.

Vectored intercept, [deleted] where the submarine force commander directs one of our submarines to move as rapidly as possible to that area to intercept the enemy submarine; and finally, antisurface operations, where our submarine is directed to penetrate a screen and to attack a fleet of enemy surface ships.

All of those have been examined, and with the Chair's indulgence, let me show Mr. Spence what those conclusions were because this is relevant to the whole question of effectiveness.

[Viewgraph shown.]

Dr. MANN. The 688 classes on the right, the 637 on the left. Everything is referenced to 688 submarines, so that's the reason for "1." If it's more than one, it means better than; if it's less than one, it means not as good as.

The point is that, in the case of the 637 types, the difference between their effectiveness for each of these 5 tasks a 688 is appreciable. It's of the order of 15 or 20 percent, average across all of them, and you can see the range here: .8, .8, .9, .9, 86, .8, .8.

In the case of the [deleted] candidate, or the equivalent to the fleet attack submarine that is currently under design at the Naval Sea Systems Command, the differences are within the uncertainty of the calculations: 98 versus 100, .93, 1.00, .98, .99 and .95. That's what accounts for the statement that the report makes that the [deleted] candidates for these tasks, and, again, exclusive of escort of a high speed carrier task force, are essentially equivalent to the 688.

Mr. SPENCE. The reason I was asking that, are there any missions that you didn't cover in the "Alternative Study" purposely?

Dr. MANN. The only mission that we deliberately did not cover and which I've stressed was not covered simply because the 688 is clearly the most capable for the purpose, is the high speed battle group of carriers, transit or task force escort role, so-called direct support, where for example, two carriers and associated ships are moving [deleted] and in order not only to keep up with the task force but also to do the necessary zigzagging in order to skirt around and explore and then come back and still stay abreast of the task force you need a submarine with the 688's speed capability.

The point was made at the very beginning of the report, and I have stressed it in both the last meeting and in this one, that the number

of 688's that have been authorized, or that we hope will be authorized in the next several years, will be sufficient for the number of carriers that we have.

So from that standpoint the number of 688's is adequate, and what we are really looking at is all the other tasks that submarines are assigned to accommodate and the question of whether a smaller, less expensive submarine would be as effective in these tasks as a 688. The difference is a small one. For most purposes it is almost the same.

Mr. SPENCE. What about the attacking, or the intercepting [deleted] of enemy submarines?

Dr. MANN. Most of those tasks involve detection and classification and then acquiring a fire control solution in order to attack the enemy submarines. If an enemy submarine, for example, is moving [deleted], then clearly a submarine that can only do [deleted] will not be able to keep up with it. In fact, under those circumstances it would be difficult for any submarine to keep up. The reason for that goes back to a point of submarine tactics. You can't listen well enough while moving at very high speed. You have to slow down from time to time in order to listen for two different reasons. One is so that you can hear better and make sure that you're still [deleted].

So at some point you must slow down, and if the enemy, for example, is simply trying to get away, moving very fast, then it may be difficult, even for a 688 class submarine, to slow down, listen [deleted].

But in most wartime scenario circumstances, what we attempt to do is to employ stealth, covertness, surprise, to seek him out without ourselves being detected, or to lay in wait and get a shot off at him before he hears us and gets a shot off at us.

Mr. SPENCE. I think you're right there.

One of the things I remember from reading the summary on the scenarios you have on the antisurface ship warfare, an enemy carrier, the way I understand it, has engaged in an engagement and he's going to escape from the engagement or after the initial attack and they are leaving the scene, and they're waiting. How are you going to be able to catch up with them in order to deal with additional ships entering the area after the initial engagement?

Dr. MANN. There are several answers to that. The chairman asked a question somewhat related to that, and I suggested that that might be an appropriate question to put to Admiral Griffiths and the operators when they appear before this committee.

One thing is, you hope that you don't have to engage not only a surface task force but also several enemy screening submarines all by yourself.

It may even be necessary in some circumstances to try to arrange for reinforcements.

But more to the point, after you have taken the necessary attack action you will use any one of a number of evasive maneuvers to get away and to avoid being detected [deleted]. They are much more appropriately discussed by someone like Admiral Burkhardt, than by me. But they may include any number of techniques such as to slow down, to go deeper, and in some special environmental circumstances

to go shallow. In some instances you may try to go fast, but the danger in going fast is that you are more easily heard. So everything really depends on the specifics of the local scenario, and every submarine commander who has been through that kind of training has a whole range of actions that he would take in any given set of circumstances.

Mr. SPENCE. Something really keeps gnawing at me, and maybe I can address it in this question; is the 688 the best attack submarine we're going to build?

Dr. MANN. At the present time, the 688 unquestionably is the best attack submarine. Let me make an even more generous statement. It's the best attack submarine in the world. It's the best submarine that we know of. It's certainly the best one in our fleet, and in all important respects we wouldn't trade a 688 for any other submarine that we know of. There's no question about that.

Mr. SPENCE. What you should really be looking forward to then is a follow-on submarine. Do you think there'll ever be one built better? If we take these new ones, will we start building less capable submarines?

Dr. MANN. In the first place, the 688 itself can be improved, and there is underway a rather intensive study, also under Rear Adm. Webber looking at techniques for improving the 688 principally in terms of quieting.

Mr. BENNETT. Will you yield just a minute?

Mr. SPENCE. Yes.

Mr. BENNETT. If you knocked out the quieting differential between ours and the Russian submarines, would that change the statement you just made? Would you still say that the 688 is better than anything?

There's a nod in the back row there, so I assume you'd say the same thing.

So what else is there that makes it so much better? I've heard the statement you've made, and you've made it several times, and I was just curious. You said the Russian submarines go faster and they can go deeper. So I'm wondering where is its excellence. I'm not saying it's not there. I'm just trying to find out where it is.

Dr. MANN. The excellence in our submarines derives in large measure, but only in part, from their quietness. We believe that our sensor suite which enables us, to detect and to track enemy submarines, is at the present time considerably superior to what we give the Russians credit for having.

In some of the comparisons that have been made, we try to stress our estimates of how well we really are doing by giving the Russians credit, for example, for combat equipment which is as good as anything that we have, and even in those circumstances, even if we give them the same kind of sonar equipment, the same kind of weapons equipment, the principal difference is the relative degree of quieting in the case of our submarines.

Mr. BENNETT. The principal difference. But then somebody in the back row cheered you on, saying there was something else that made you better, and you said that was the detection ability. It's not in weapons?

Dr. MANN. We believe our weapons are better.

Mr. BENNETT. I see.

Dr. MANN. And second, and more importantly really, we believe that our sonar equipment, our detection equipment, is far superior to what they have.

Mr. BENNETT. I yield back to Mr. Spence.

Mr. SPENCE. I think I have about completed.

What are our plans? I don't guess they're firmed up yet, but what are our tentative plans as far as submarine shipbuilding is concerned?

Everybody acknowledges, I think, that at the rate we're going we aren't going to be able to reach our goal.

So are we going to speed up the number of submarines we're going to build? What are our plans?

Dr. MANN. This is, of course, one reason both for the study and, I would imagine, for the hearing. The problem, as we all know, is that at the present rate we are not going to have anything like the number of submarines that we feel at a minimum we require.

As I mentioned last time, the estimate that the Navy makes of the number of attack submarines that it would need in order to fulfill its tasking during war is more like [deleted] than 90. But 90 represents an acceptable minimum, and at the present rate we won't even come close to 90 when the 637's begin to fall out.

So the question is: How do we increase the rate? And, as I pointed out a little while ago. Mr. Spence, one reason for looking at less expensive submarines that do not have all of the capability of the 688, but for the tasks that you asked about come very close to the 688, is to use that cost saving as an offset against an increased building rate.

If we were only going to build one submarine a year, as we are doing right at the moment, and we knew that that was all we would be able to build, then I would be the first one to agree—and I think everyone would agree—that building 688's would be the way to go.

The question is, How do you increase the building rate to get the larger numbers without having to increase the funds required as much as you would need to if you went only with 688's, and that's the reason for looking at less expensive submarines.

Mr. SPENCE. What worries me is even if we get less expensive submarines, taking the mood of not so much the Congress as the administration, maybe, I don't foresee us building, say, four or five less expensive submarines a year to catch up. We're going to have to have that many, I understand, in the out-years to catch up since we're falling so far behind.

I would like to see us build four or five submarines a year sometime down the road, but I just can't really foresee that, unless we don't build anything else in the way of ships, and that's what worries me right now more than anything else. Even if we get less expensive submarines, is that going to help the situation from the standpoint of our numbers, in the final analysis?

Dr. MANN. It's hard to say how the program and the allocated fraction of the total shipbuilding program for submarines will develop in the next several years. I can't answer that question any better than anyone else can at this point, but it is at least likely that if one could come forward with a less costly submarine that has adequate capabil-

ity with respect to those basic missions, very much the same as, say, a 637 does today, the Navy would strongly recommend that we try to increase our building rate and use the savings to help defray, or to offset, some of the increased cost. In other words, let me repeat again, if we build only one a year we ought to build 688's. If we can see ourselves moving to two or three or more a year, then if we were to build only 688's the cost would be considerably larger than if we built less expensive submarines, and that's the reason for the interest.

Mr. SPENCE. Thank you, Mr. Chairman.

Mr. BENNETT. Mr. Fazio.

Mr. FAZIO. Thank you, Mr. Chairman.

I can appreciate your arguments about cost-effectiveness and things of that sort, and ultimately they may be more compelling than all of the analyses that you've discussed.

I would like to for a few minutes to continue on that line of questioning and perhaps follow up on some of the points that Mr. Spence made.

I missed your first presentation so I'll have to try to catch up a little bit.

I was wondering if you would expand on your responses to Mr. Spence in regard to the issue of [deleted]. He brought the subject up, and Mr. Hale indicates that the concept of sprint and drift is really important and that as the enemy ships become faster, and of course this is what we're hearing, perhaps our capability of having a couple of knots advantage is very crucial, and to the extent that we're losing capability perhaps even of maximum quiet speed we may be losing our capability of effectively trailing enemy submarines.

Dr. MANN. As a matter of fact, Mr. Fazio, I have, and I suppose I could even show, some examples of how sprint and drift is performed and where and how speed becomes important.

It's largely a function, of course, of how fast the enemy is going. In the limit, if the enemy is attempting to get away as rapidly as possible and he moves, say, [deleted] at flank speed, [deleted]. In another sense it's made difficult because if we can't keep up with him we obviously aren't going to be able to do [deleted] and so in a sense that's a relatively straightforward or simple situation.

Usually, however, the situation is a different one. If we get a clue as to the presence of the submarine as a result of our various detection capabilities like: air, undersea and [deleted] we will inevitably try very hard to move in on him so that he does not hear us. To catch him unaware is basically the point. If he should turn tail—and one doesn't even have to look at *Charlie Victor* types that can perhaps do [deleted]—but go to the limit of the *Alfa* class, which has been [deleted] of course he can get away.

Mr. FAZIO. He can get away from the 688 class?

Dr. MANN. He can certainly get away from the 688 class, and in the limit, even a [deleted] submarine is going to have a great deal of difficulty in doing much to prevent the escape of a high speed submarine.

But in most circumstances we attempt to employ covertness, our superior sensing capabilities, and one other thing, which is coming much more to the fore and which really needs to be placed in the context of looking at the future. It's difficult to discuss in great detail because some of what will be developed isn't completely known yet.

But looking toward the future, it has seemed to many of us that what is most important to go along with quieting and our superior sensing capabilities is the speed with which we can get a fire control solution, that is, to be able to classify and track the enemy more quickly than we can do now at sufficient range so that we can use a standoff weapon. In other words, we should be able to fire at him at a range well beyond what he would require to hear us. The reason, in part, for that is that we don't want to expose ourselves. We can't afford, given our numbers, to get into a situation where we have to engage in a shootout, a quick draw type of shootout, a dogfight, if you like. The reason is that we don't even want to lose one. He'll outnumber us overall almost under any circumstances, and in that kind of an engagement situation our objective would be to try to get our shot off, to kill him without ourselves being detected, or to be able to make a kill sufficiently certain so that he could not turn around, or evade, or get away. With the kinds of new weapons that are available and are becoming available, whether they be standoff weapons, that is, missiles, or torpedoes, once you have located the submarine and fired the weapons, if you're reasonably close to a good fire control solution, there is really no escape.

Another point that's important to keep in mind—this gets very complicated, and I'll do my best to talk to the point, but here again I think the committee will recognize that it will do much better to talk to the admirals who do this for a living—is that a torpedo, for example, our MK–48, will, when it's homing in, do [deleted] and it's even possible that in some circumstances we can get a bit above that. The new lightweight torpedoes that are used by surface ships and by aircraft can also do [deleted], or will in the future. In those circumstances, even a [deleted] submarine is not going to get away. So the point is to think in terms of maximizing our strong points, our big cards, of quiteness, of sensing capability, of weapons capability, to get in for a kill before he hears us, get our shot off and get out, rather than to get into a dogfight-like situation.

Mr. FAZIO. Your comment leaves me with a general picture, and I hope we can look at two other criticisms of the analysis, and that relates to antisurface ship warfare and the vectored intercept concept that you explained earlier, and both of those speak to the inability to pursue the engagement or to get away, both of which are criticisms of the smaller submarine from the standpoint of speed.

So your response really to my first point, to be consistent, I guess, is you're saying that in effect if we don't build a new faster attack submarine, even faster than the 688, and that appears to be our current policy and perhaps is reality, we really are giving up speed as an area of competition. We hope to maintain perhaps what we have. If we build a smaller submarine we drop back. But we're really going to try to enhance the sensitivity and the quietness, in effect, not compete on the issue of speed, not attempt, for example, to keep up with the Soviet developments that have been emphasizing speed as opposed to quietness.

Is that a fair statement?

Dr. MANN. I think that's a pretty fair statement, yes.

Again, there's a matter of operational judgment, much of which was translated into these effectiveness numbers that are based, after

all, on experience in submarine exercises within the fleet, and it's an operational judgment as to what you value most highly in an actual engagement or for combat purposes.

I think if you ask any of the submariners, there is no question that they would, and all of us would, like to have a faster submarine, a more capable submarine from the standpoint of sensors, and have the weapons, and all of the rest. In principle, of course, if you spend enough money you can do that.

But the problem again is also one of numbers, because one ought not to think of a submarine engagement as being merely a one-on-one kind of situation, but really to think of the problem on a force-wide basis. There are many war stations that have to be covered. There will be many enemy submarines that will have to be dealt with. And it would avail—I believe you would all agree—us very little if we had an exceedingly capable submarine, but in such small numbers that we were only able to cover a limited fraction of the total tasks that the submarine would have to service.

So the problem is really one of a judgment call on how to balance numbers and the costs that go with that against the individual, or unit, costs and the differentials in effectiveness.

I would agree with you. I think that speed would be very desirable. The Soviets have apparently moved in the direction of a [deleted] submarine. It's by no means clear, however, how many they will have in the future or whether this will constitute a major fraction of their force. At the present time, as you know, they only have a very few.

Again keeping in mind weapons, smart weapons, so to speak, is it better to invest very heavily in your platform to make the platform go faster, or is it better to invest in a platform emphasizing the weapons capability, similar to the way that we've been doing with aircraft, for instance. You try as hard as possible to avoid having to build everything you want into the parent platform because that makes for very great expense and also generally does not eliminate the kinds of risks that would be eliminated if you could move, if you could operate and engage in combat at greater distances with very smart homing kinds of weapons. This is as true in the air warfare business as it is in the submarine business.

Of course speed is nice. The question is: How much speed must you have as opposed to how much would you like to have, and how much are you willing to pay for it, given that you can have [deleted] torpedoes, for example, or missiles that can be used at those ranges without being heard, fire a shot off, kill the enemy and get out and tackle something else, as opposed to getting into close combat where you're engaged in a kind of an old-fashioned dogfight?

Mr. FAZIO. What increased capability would we have in these new, smaller types or in any modifications to the 688 class that would increase the sensitivity or which would enhance, if it's possible, the quietness of it? In other words, if that's our strategy, what are we pursuing that would in effect make us even more competitive in that realm if we aren't going to go in the direction that the Soviets apparently are going, which is speed?

Dr. MANN. Again, your question, which is a very pertinent and a very comprehensive one, has to be answered in two parts.

So far as the submarine itself is concerned, a number of changes in design and technology are being carefully considered that would lead to quieter operation. Many of these changes in fact, are also being considered for modifications in the case of the 688. They're universal.

Mr. FAZIO. I was hoping that that was the case.

Dr. MANN. It is, and whether it will be cost beneficial to employ them in the case of the 688 class, because the initiation of any new activity of that sort is going to involve a considerable startup investment and add perhaps to cost, or whether they will be reserved for a new class, such as the fleet attack or fast attack submarines is still a matter to be decided.

But these include a number of things. For example, an [deleted] which has been designed over the last several years, which has been tested, and which can operate for either the larger or the smaller reactor, much quieter than the ones that are currently in existence, with considerable improvement in quieting. The use of a [deleted]. The 637 at the present time uses a drive which operates [deleted]. The 688 class has taken that down [deleted]. The Trident submarine is employing [deleted]. The new designs are aiming toward about [deleted]. Coupled with that, the use of a specially designed, a new type of, [deleted].

There are a number of these things, and Admiral Webber is better qualified than I am to go into much technical detail.

But that's one side.

On the other side, the Navy has had from the very beginning, and still has, a major program aimed at improving its combat suite, which includes all manner of detection equipment, active as well as passive sonars, processing equipment, and fire control equipment, as well as weapons. Consequently, any new submarine, whether a reengineered or improved 688 or a new class would have the benefit of an improved weapon suite and combat equipment that allows for more sensitive detection at greater ranges and more rapid localization. Thus no matter how we proceed in the future, our submarines, not only in terms of the new class but on a continuing basis, will derive the benefit of an extensive and a very successful R. & D. program that continues year in and year out to try to develop improved capabilities.

Mr. FAZIO. My last question would go back to speed.

I would appreciate it if you would just give us the maximum quiet speed and the maximum speed for the prototype, the smaller submarine, and the 688, and, if you would, comment on your perspective as to what modification or enhancement of the Soviets' attack submarine speed would you believe would trigger the need for us to respond in that area? In other words, I understand the basic premise you're operating from, but at some point perhaps a certain increase in their capability, in their speed, might trigger a response, and I'm wondering what you think that would be. Clearly that's the emphasis they're placing, and at some point perhaps you can no longer ignore that area of competition. Where would that place be?

Dr. MANN. The answer to the first part of your question is straightforward. But the answer to the second part is very, very difficult.

Mr. FAZIO. I understand.

Dr. MANN. The first part, that is, in the case of the 688, the maximum speed [deleted] within 10 percent, and the maximum quiet speed [deleted] where quiet speed is defined [deleted] in the case of the 688.

In the case of the fleet attack submarine—and again I'm anticipating the final outcome of a study that hasn't yet been released, but I hope Admiral Webber and the CNO and others will forgive me for anticipating—if it turns out—that the maximum [deleted] it's likely that the maximum quiet speed [deleted] and in the case of the [deleted] candidate, which we displayed, because of the fact that it employs a different type of reactor, a [deleted] reactor, as distinct or different from the pressurized water reactors that are employed in the 637 or the 688, the maximum quiet speed is closer to the maximum speed than in the other cases. There the estimate that I showed in the report [deleted] for maximum speed and [deleted] for maximum quiet speed.

It's interesting, by the way, for you to note that in the case of the Trident, which employs a [deleted] reactor, that it, resembles what I have just described to you for the [deleted] where the maximum quiet speed is closer to maximum speed than is the case with the pressurized water reactor.

The answer to the second part of your question, what would trigger us off to become more concerned than we appear to be at the present time over speed, what could the Russians do, or what might the Russians do, I'm really going to have to think hard about that.

One obvious answer to the question is that as their submarines and our submarines come closer together in other respects, the premium on the difference increases, where the difference is now speed. In other words, if they have a combat suite which is very much like ours—and there's no reason why in 5 or 10 years they couldn't, or wouldn't—if they decide intensively to quiet their submarines, and let's assume that they achieve a level of quieting that's the same as ours—we don't see this at the present time; we haven't seen any evidence of it, but it's not beyond the realm of technical possibility—if, in other words, their submarines become very much like our submarines in all respects except speed, then obviously, in that circumstance, we would be at a significant disadvantage.

We trade on sensors, on weapons, and on quietness to compensate, where necessary, for speed, and we further recognize that in many instances we don't need to use, or don't use, maximum speed. You generally will operate [deleted]. We seldom go at flank speed, or at nearly flank speed: however, there are some circumstances where we have to.

So the answer, the broad answer, to your question is that the closer they come to matching us in all respects where we currently feel we have a significant advantage, the more likely it is that we would then feel constrained to move in the direction of higher speed, and, needless to say, we could. The consequence of that is expense.

Mr. FAZIO. At this point though you don't see any speed that they are attaining, or appear to be able to attain, to be sufficiently great to undermine the advantages that we continue to have? As I understand it, that's the bottom line of your statement.

Dr. MANN. That is correct, and I think that states it better than I would have.

Mr. FAZIO. And you see an increasing capability in terms of pursuit, and sensitivity, but you don't see any particular emphasis or success in accomplishment on their attempt to quiet their submarines?

Dr. MANN. We see a gradually quieting trend, but it's very gradual. It has moved in fits and starts over the last 15 years or so, and as far as we know at the present time—and I'm getting into the intelligence side of the undersea systems study—they are still well short of us in quieting, and well short of us in sensor suite. We see some improvement, or we project some improvement, in sensor suite, but, as I said before, even with those improvements that we see some evidence of, or project on the basis of recognized technical and technological capabilities, we don't see them matching us for quite a number of years into the future. However, to try to predict beyond the next 5 or 10 years, is, to say the least, foolhardy.

Mr. FAZIO. Thank you very much.

Mr. BENNETT. Mr. Mollohan.

Mr. MOLLOHAN. Mr. Secretary, the other day I indicated to you my concern and disappointment in our research and suggested that we make this the next class of our submarines. I'm even more concerned now after listening to the responses to Mr. Fazio than I was before.

When we make comparisons here, with the election that we have made, the decision that we have made, with reference to a carrier for our weapons systems in the Air Force, talking about the B–52, which carries a greater number of missiles, and scrubbing the B–1. Let's use that as a comparison.

But you were talking about, as I said, the other day a submarine which would be our next class and that we would be depending on very greatly in the latter part of this century and the first part of the next century. And we're projecting within 5 or 10 years a capability for Soviet equality with us in the quietness area, and a superiority of [deleted] for speed in their ships, in their submarines, which they have today, and very probably the ones that they're going to develop and produce in the future. I think you told me, or you said in your statement the other day, that we're going to use the technology we have today and accept the less effective weapons systems in the submarine than we have in the 688.

It just seems to me that we have to accept, as I think all of you do, that our Soviet friends are going to concentrate on their deficiencies, and obviously their deficiencies are quietness and sensor suite, and you tell us that they're making progress in both of these areas. But we sort of just go backward in this thing. Here we're accepting a ship for our next generation which is obviously [deleted] slower than the one that they're going to use, and we're accepting that they do have, or should have, or we just accept that they do have, a capability to overcome their problems in the quietness and the sensor suite area.

It just seems to me that somewhere along the line our civilian decisionmakers have told the Navy, "Here's what you've got, and here's what you're going to take," and I can't conceive of a professional naval man accepting this quietly, unless he's doing it under very strict orders. I just can't at all accept that this is what we want to do and the way we want to do it.

We here in the Congress have been fighting this nuclear carrier battle for the last several years, and as you undoubtedly know this year there is included in the budget a *Nimitz* class nuclear carrier.

I think that the public is really much more generally conscious of what we need. I just came from a chamber of commerce meeting this morning, a group of 24 people, leaders of the chamber of commerce in my congressional district, and they very emphatically expressed great concern over the draft, over our defense posture, et cetera.

I think the Congress is becoming much more conscious of this, too, generally speaking, as the vote on the nuclear carrier indicated the other day.

I really don't want any answers to any of this. I just wanted to express my concern about it, Mr. Chairman. I think it's a tragic way to go, when we accept that we'll be giving up our defense capability in relation to the Soviets potential capability and we do it because of dollars. I think it's a dangerous course to pursue.

Mr. BENNETT. I think, Mr. Mollohan, you well stated it's the national will to come to grips with this. I think we've found this about as well in the Navy procurement of ships as any other one I can think of, and there are not so many of them, and whether we're going to get any of them. I just feel that we're at the place where we can benefit our national defense.

Mr. Mollohan, do you have any further questions?

Mr. MOLLOHAN. No.

Mr. BENNETT. Mr. Emery is next.

Mr. EMERY. Thank you, Mr. Chairman.

We keep coming back to the question of quietness and maximum quiet speed and top speed as the factors that are important or critical.

According to the study it was determined that some of the smaller submarines, as well as not having maximum speed as high as the 688 class, also have a significantly slower quiet speed. It seems to me, when you consider the objectives of a submarine force of specifically searching out, tracking, and nursing Soviet forces, with the maximum speed being significantly slower than the Soviet capabilities and, as a matter of fact, significantly slower than our own submarine force, that leaves us at a tremendous disadvantage to perform the missions that they might need to perform.

According to the study you have various candidate subs, 1, 1a, with a maximum speed [deleted] and a maximum quiet speed [deleted] another sub, 2a and 2c, according to your study, with a maximum speed [deleted] and a maixmum quiet speed [deleted] which is a little bit better. But then SSN–3 and SSN–3a, which I guess are 688's or modified 688's, you have [deleted] maximum speed and a maximum quiet speed [deleted].

Aren't those two speeds directly related, and if we have a submarine which is slower than the 688, aren't we also sacrificing the maximum quiet speed all the way down? Isn't that the advantage of the faster, quieter submarine? It just seems to me that the study indicates that there's a flaw in the whole concept of going to a smaller, less expensive submarine, which is the notion of not only maximum speed but very clearly of the quietness which we're trying so hard to achieve.

Dr. MANN. The statements which you just made, Mr. Emery, are correct as far as the speeds are concerned.

The reason for having attempted to use experience based simulations of various tasks which submarines are called upon to execute is that one can't simply draw a comparison of effectiveness on the basis of speed alone. One has to take into account what the submarine has to do in executing its tasks and how quiet it is at any given time during the performance of these tasks. The outcome of that is what led to the table that is in the report, and that I showed earlier, that compares effectiveness on the basis of all of the factors that you've just mentioned: maximum speed, maximum quiet speed, and the like, for the various classes. I have to accept the conclusions, not question whether or not the assumptions that are normally made in the design of such simulations are valid. I've simply taken the ones that are normally employed by the submarine warfare community and run our candidate possibilities through them.

The numbers that come out indicate that within the uncertainties of the simulation analysis for a submarine conducting those five basic tasks, or missions, here the [deleted] candidate represents an interesting one, their effectiveness in the conduct of each one of these five basic tasks is essentially equivalent to that of the 688. The reason for that is that the submarine, whether it's a 688 or a 637, or any other candidate doesn't spend much of its time at or near either maximum quiet speed or maximum speed. Thus, a good deal of what goes into the effectiveness measure depends on a range of other qualities, other attributes, that the submarine has, and these are heavily weighted in the direction of quietness, sensor range, and all of the rest.

Mr. EMERY. I guess the thing that bothers me, and I think every one of us here have expressed their concern, you may be very correct in saying that a submarine doesn't spend much of its time or a great proportion of its time at maximum speed or maximum quiet speed, but the fact is that when it needs maximum speed and when it needs maximum quiet speed it's a critical situation, and if it doesn't have that capability you might as well not have a submarine at all.

If you need a maximum quiet speed to perform a maneuver, to get to a position where you can either outmaneuver an enemy or listen for an enemy, and you don't have that maximum quiet speed capability that you need, then it just seems to me that you've run across a very fundamental and important fatal flaw in the design of that submarine.

We've spent in the entire submarine program, as far as I am aware, from the very early days of the program, building up the capability to go a little bit faster and to be a little bit quieter. I'm aware of some tests that were run on submarines a few years ago in your program, using all kinds of strange methods, including friction reducing, springs, flumes, and different shapes, to try to squeeze an extra knot or two out of the submarine.

Now, why all of a sudden, after all of that work do we finally come to the idea that since a submarine doesn't operate at maximum speed or maximum quiet speed that somehow or other it isn't important? Frankly, I think that whole idea is preposterous. We know that the Soviet class SSBN's have [deleted] speed capability, and the *Victor* class SSN's are capable of speed [deleted] and the *Alfa*, according to some estimates, maybe as high [deleted].

Given that those estimates are correct, what do we do in a situation where one of our submarines has to contend with these capabilities? We simply say, "Oh, we decided a few years ago that since our submarines don't operate at maximum speed or maximum quiet speed, we can't contend with it; we won't bother with it." It just seems to me that for the paltry savings which may be involved with these candidates and the number of additional submarines that may be built as a result of these paltry cost savings what we're really doing is sacrificing two very important advantages, one being quietness and the other being speed, which we've spent a good deal of time trying to build into our submarine force.

I appreciate the advantage of trying to do a study like this to see if there are improvements that can be made, but I, for one, just think that the sacrifices that we're making in operational ability for a very small saving of money which, God knows, in this Congress we probably will not build the submarines anyway, we would be really cutting our own throats.

That's kind of a statement, but I would appreciate your comment on some of the points I made.

Dr. MANN. The first observation I would make is that I am not—and I will stress it again—I am not advocating a less capable, smaller, slower submarine as a thing most highly to be desired. The purpose of the study was to explore how much one could save if one were willing to give something up and what the difference would be in effectiveness if one gave up something. All of the rest of the report, in a sense, is an amplification of that.

I would say very straightforward to you, Mr. Emery, that if the money were to be provided and accepted, it would clearly be desirable to go with the more capable submarine. The problem is one of numbers and one of available financing.

Mr. EMERY. If I could interrupt you?

You have said the problem is one of numbers within the system. Of course, that's a problem that this subcommittee has been fighting for a long time, a 600-ship Navy, and now we're talking about something that's a little less than that, and then we come up with the idea that numbers aren't as important as the characteristics and the capability of the ship. So we're told that, oh, well, the smaller numbers are all right if the characteristics and capabilities are in fact superior, and I happen to agree with that to a certain extent. But the fact of the matter is that—and I think it's been pretty well shown—for the very small saving of cost we're probably not going to increase our submarine force very significantly.

So my fear is that if we start moving to a smaller, less capable submarine, especially when we have seen a degradation of operating characteristics, which has shown out, what you're really going to end up with is the same number of submarines that we had and probably the 10 percent or whatever we save in money is going to be eaten up with 15 percent inflation.

That's just an observation, but I have some other questions about the study that I'd like to get into.

On two occasions the study explained that at-sea exercises have demonstrated the need for SSN-688 speed, [deleted] in the direct support task, supporting a carrier task force, for example, and there-

fore the direct support task was not analyzed since only the more expensive alternative candidates would produce that [deleted] speed. You suspect that such a smaller submarine would have to perform some other task. In other words, very simply stated, slower speed, to keep up with the task force.

Dr. MANN. No. If we compare what we now have, 637's and 688's, there's no question that if the task force moves as was specified there [deleted] that only the 688 can accommodate that requirement.

The point was also made in the study that the reason for omitting it is not that we didn't want to consider the question but that the number of 688's that are currently authorized or are likely to become available in the course of the next several years, which might number, say 35 or so, building [deleted] would be sufficient, to provide at a minimum, direct support or escort capability to the carriers, given the number of carriers we have and given the number of submarines.

All the other tasks that we've listed, that are identified and considered in the study, would be allocated, so to speak, to the follow-on submarine, whatever that happens to be, as they are right now to the 637 class. In other words, the SSN–X, whatever that turns out to be, would not be employed in the carrier support or carrier escort role; 688's would be reserved for that. If you had all 688's, then, of course, you would have more flexibility.

So in effect one is looking at a situation where, in the interest of increased numbers, certain tasks must be performed by 688's. All other tasks would be performed by either 688's or a new class of submarine, if that's what one goes for.

But if you will permit me, Mr. Emery and the chairman, I would like to, for the record at least, return to two or three points that both you and Mr. Mollohan have made to insure that there is no misunderstanding.

In the first place there has been no decision made with respect to the direction in which we are going to move. The CNO hasn't made a recommendation or a determination yet. The Secretary of the Navy didn't. As far as I know, there hasn't been one in OSD.

The only purpose of this whole enterprise is to see how much you can save for given tradeoffs and what that buys you or what you lose.

Second, if one is not going to have additional numbers—that is, if you're not going to increase the building rate, for whatever reason—then obviously you're going to want to go with the higher capability submarine. There would be very little point in that circumstance in taking seriously a submarine that's less capable when you know you're going to have to depend on a very limited size force.

The only reason, again, for being interested in anything that's any cheaper that still has a large measure of capability for those tasks is in the interest and in the hope of an increased building rate and a closer approach to the desired force numbers.

Mr. EMERY. One other question I want to ask with respect to cost.

Didn't the study show that with respect to flexible tasking the SSN–3 candidate proved to be a more cost effective way to go in both acquisition and life cycle, as opposed to the other alternatives, and, in fact, wasn't that approach a third more cost effective?

Dr. MANN. I'll have to go back and look. It might be. I think I have one of these here.

Flexible tasking, of course, permits relative costs and life cycle—why don't you put that on for the benefit of the rest of the committee?

[Viewgraph shown.]

Dr. MANN. Let me explain for the benefit of the committee that there are two kinds of tasking that are considered in the report and that are commonly employed: so-called static tasking, where a submarine is sent to a particular area and is left in that area to do whatever it needs to do; and flexible tasking, where a submarine is brought into a particular area but then is tasked repeatedly by the force commander or by someonee else and sent off to do various tasks as they come up. Flexible tasking makes more effective use of our available submarines, and it also places a greater premium on speed, obviously, because in this case, if the force commander directs the submarine to go from one place to another place and embark on a still different task, obviously there's an advantage in moving quickly.

What I have here are two viewgraphs which show follow-ship costs in relation to maximum quiet speed and also in relation to maximum speed, referenced in all cases to a 688.

[Viewgraph shown.]

Dr. MANN. Normalized reference, a unit, in other words, 0.9 means 90 percent, and 1.1 means 110 percent of 688. This is laid out as a function of distance from base.

You will recall, from the very first viewgraph, that [deleted] as indicated here, is close to 7,000 miles, [deleted] perhaps a little over 2,500, [deleted] a little over 4,000, [deleted] 3,000 to 4,000.

In any case, 3 and 3a are 688 derivatives—3a is a somewhat improved version; 2a represents the [deleted]; 1a can be taken as a 637-type somewhat improved.

You can see from this that on a follow-ship cost basis as you get to greater and greater distances where speed pays off more in terms of getting to the area more rapidly, having more worktime, so to speak, in the patrol area, that the follow-ship cost, referenced to the 688, is perhaps 10 percent greater for equal effectiveness, or, to put it another way, if you want the same cost, then you have to have effectively 5 to 10 percent less effectiveness in terms of the use of your forces. Quiet speed is the key factor in this instance, because the 637 is [deleted] and remember, 2a is the [deleted] which has a quiet speed maximum [deleted] in the case of the 688. Again, you see the same kind of differences.

The differences are even more marked if you look at life cycle costs, again for flexible tasking.

[New viewgraph shown.]

Dr. MANN. There is no discounting that's involved here. So everyone has to make his own judgment on the significance of talking about life cycle cost over a period of 25 years, where in effect you will assign the same weight to what you spend 25 years from now as to what you spend at the present time. The differences here are quite marked.

In the case of life cycle cost, comparing the [deleted] with the 688, shows a difference on the order of about 10 percent at the short ranges.

and perhaps close to 15 percent at large ranges, and something equivalent to that in the case of maximum quiet speed.

The difference in the case of the 637 types is very noticeable.

So once again—and I've said this before, and I apologize for the repetition—but the point is that it may indeed cost more on a life cycle cost basis to go with a somewhat less expensive submarine, and it makes sense only if you can increase the building rate and use some of the acquisition saving on a unit basis as an offset for that increase. Otherwise, if you're going to end up, as you suggested earlier, Mr. Emery, with the same building rate, you're probably going to be better off, and I think we all tend to agree with that, in going with a more capable submarine.

Mr. EMERY. That's the point that I'm more concerned about. We concede that if we're going to be able to minimally reduce the operating characteristics of our submarine force, but come out with a significantly larger force then it might be something to consider. But I don't think anyone sitting in this room believes that we're going to be accelerating our submarine building course very much at all. What we may be doing, in fact, is holding the status quo in the building rate and coming out with submarines that just simply can't meet the increasing challenge.

Mr. BENNETT. Would the gentleman yield at that point?

Mr. EMERY. Yes; I yield to the chairman.

Mr. BENNETT. Wouldn't you rather think that a pretty good test of this—and I think it almost would advance your plea—is whether or not we would get at the same time as the recommendations for these cheaper submarines a 5-year program which would show a substantial and consistent production of submarines?

Judging from the past, there's no way such a request is even going to be made on paper, without a further request made to Congress. They can always slide back.

If you'll remember a couple of years ago we had a 30-ship 5-year program, which slid to about 14, or something like that, when we actually got to the request. So if the Navy is not even allowed to project a program which would make sense, and I sort of feel that might be the threshold, then there's no use in us thinking about it at all. But that is sort of an illusion, because you'd be asking for or requesting when you're actually not allowed to project it.

Do you have any further questions?

Mr. EMERY. No, I have no further questions, except to say that I think your analysis is exactly correct. We have absolutely no guarantee that we're going to have any more submarines built, and, in fact, maybe a guarantee that we'll have less-capable submarines built eventually at the same price.

Mr. BENNETT. Mrs. Byron.

Mrs. BYRON. I have one observation.

When you were here before and testified we spent a great deal of time discussing depth versus the speed, and I think all of us came to realize that we would give up the depth capability and go for the speed capability.

Yet, today I think we have discussed the possibility of a willingness to give up some speed and some quietness for a larger percentage

of production of submarines, and yet we sat here and gave up quietly on the depth problem. Now today we're sort of mulling over whether we will be willing to give up a little bit of speed and quietness, and possibly get a few more submarines constructed.

It concerns me that we are just quietly listening and giving up on the projects and our concerns, because I think you testified that speed was much more critical than depth. Now you're talking about maybe speed, maximum speed might not be that critical, and this is something that I think we all should think long and hard on.

I agree with Mr. Emery in his comments on the fact that when we need the speed we want to be able to have it.

Dr. MANN. Mrs. Byron, may I correct one rather important misconception?

There is no plan that I'm aware of for giving up on quietness. In fact, every design, whether it be a new submarine, a small submarine, or a large submarine, or an improved 688, will improve the quietness of the submarine. There is nothing I'm aware of that will move us away from improving on quietness.

So far as depth is concerned, you are aware that the 637 class, which was started some 20 years ago, was designed to go [deleted] maximum depth. The 688 class, which goes back 10 years or so, was designed with a maximum depth capability [deleted]. As far as I know, none of the new designs, or proposals, that are being considered would depart from that [deleted] 688 capability.

Mrs. BYRON. The Soviets strongly held depth as one of their main criteria, and we opted for quietness and speed.

Dr. MANN. With the chairman's permission, let me go back to the briefings which you heard from Admiral Burkhalter and perhaps clarify a point on depth for the Alpha class and the whole issue of depth which seems to be, and which is, a matter of some concern, but also, unfortunately, a matter of some confusion.

[Deleted.]

Second—and here again I would urge that when you have occasion to call Admirals Griffiths and Burkhardt and others that you pose this question to them—most of us who have thought about this really can find very litle justification or very little method to the Russians in going to those great depths. One of the reasons for that is that, while it seems like a very great depth when compared with [deleted] in the case of our own submarines, it's not at all beyond the range of a torpedo, and it would only take a MK–48 or an ALWT.

Mr. DOUGHERTY. Would the lady yield?

Mrs. BYRON. Yes. Let me just finish.

My concern is not that we are not going for the depth. My concern is that we have decided that depth was not that critical, that speed was critical, and now today we're discussing that possibly speed, on the new proposal, is not that critical, and this is what concerns me.

Dr. MANN. A small amount of speed is, perhaps for these five tasks that I've indicated, not that critical. If the speed difference is greater [deleted] then it becomes important, and that's really the message that comes out of the report.

Mr. BENNETT. Mr. Dougherty.

Mr. DOUGHERTY. Thank you. I have a number of questions.

Mr. BENNETT. I might say that the next meeting will be on the 22d and the next meeting after that will be on the 29th.

Mr. DOUGHERTY. In times of maximum alert how many submarines would the United States have available for its mission? How many will be on station?

Dr. MANN. In times of maximum alert, given the size of our present force?

Admiral BURKHARDT. I would say with maximum alert we would probably have [deleted].

Mr. DOUGHERTY. I counted all the dots on your grand scheme of where the barriers are. You're saying that you would have to put [deleted] submarines out to cover those barrier points and also to cover your escort duty.

The question I have is, Do you really believe that the barrier strategy is going to be the strategy in a nuclear conflict for submarines? I mean you're going back to the days when the British tried to bottle up the *Bismarck*. It would seem to me that in a potential nuclear conflict we're not going to be firing the first round. The Russians are going to start something. They're going to get their ships in the Atlantic and in the Pacific because they're not dumb enough to think we're going to let them get through the barriers once the first shot has been fired.

So it seems to me that the whole strategy that this whole concept is based on is outmoded. If I'm Admiral Gorshkov, I'm going to know that I'm going to go to war with the United States and it's going to be a nuclear war, and I know that they're not going to fire the first shot.

I'm going to get my submarines past the barrier points because they're so obvious, everybody's written about them, in the Atlantic and in the Pacific and the other oceans of the world. So you can't have a barrier strategy because when the day comes for the Russians to launch their missiles, it's like a Maginot line.

Am I wrong?

Mr. BENNETT. I think you're wrong in assuming we're going to have a nuclear war. I hope we're not. Nobody wins that war. As someone expressed, that's not a war; that's an era of terror.

Mr. DOUGHERTY. But the point is one of the concepts we are preparing for is nuclear war, and I would suspect that your barrier strategy is to prevent the Russian submarines, their nuclear ballistic submarines from getting into the Atlantic, is it not?

Dr. MANN. That's one of the——

Mr. DOUGHERTY. But the other strategy, let's take a conventional war.

Mr. BENNETT. I'm not bright enough to know it, but I don't really believe these barriers are going to be very important in a nuclear war.

Mr. DOUGHERTY. No. The whole point, and I was going to say that I don't think that a barrier strategy is going to be the in thing in the case of a conventional war. Again, if the Russians are going to raise hell in Europe and launch a Warsaw attack on NATO they're going to, it would seem to me, get their submarines into the best uses, to the best places to be utilized, before that starts, and it would seem to me that they're not going to hold back knowing that obviously we're going to try to bottle them up.

So I really seriously question the validity of a strategy, a submarine strategy, based on barriers, when we have already admitted that we

will not make a first strike, be it conventional or nuclear, and so your whole concept that you can use a slower-powered submarine with a limited capability, which is basically in barrier activity, goes out with the strategy.

I would like you to respond to that because I am really getting somewhat upset by the whole tenor of this discussion.

I realize what you're saying, Mr. Secretary. You had a study to do, and you did the study, and this is a result of the study, but I am just concerned about what the thinking is of the Navy Department.

Dr. MANN. Again, I don't want to take refuge in suggesting that the question be addressed to others, but you can certainly get a more explicit and a more fully developed discussion of attack submarine tactics, optional strategy, and the like from Admiral Griffiths than you can possibly get from me.

In the first place, in answer to your specific question, fixed barrier activities constitute only a small fraction of all of the taskings that attack submarines are given or likely to get.

Further more, it's likely that, in the event that circumstances require it, barrier taskings can be reduced even further. So there is no strategy, as you put it, that I'm aware of that requires that a large proportion of the force be allocated to a set of barriers.

Mr. DOUGHERTY. Put your chart back up. Your first chart shows a significant number of submarines committed to barriers.

Dr. MANN. Yes, but, Mr. Dougherty, the point about that chart is to indicate the kinds of locations and the distances of transit, and those dots are described as representative rather than as indicative of what, in our current war plans, constitute war stations.

Mr. FAZIO. They're not proportionate to your distribution of subs?

Dr. MANN. No, and, indeed, there are only 50 locations on that graphic. There are certainly more locations that are potential war stations, which is one of the reasons why the numbers are so important.

Mr. BENNETT. Would the gentleman yield?

Mr. DOUGHERTY. Yes, Mr. Chairman.

Mr. BENNETT. One thing that runs through my mind. My staff just told me that in order to get to 90 submarines, which everybody seems to assume is essential, we have to build 3½ a year of the 688's.

Dr. MANN. Yes, sir.

Mr. BENNETT. Are you saying to us that it wouldn't seem to you to make sense to build this cheaper submarine unless we get the 3½ a year? In other words, we'd have to have 3½ a year and then add something more to it. If so, the whole thing is very academic because we're probably not going to get even two a year.

It doesn't hurt us to know all these facts, but I'm really trying to get at the bottom line, if it's true that we must have 90 of these, and you say we probably need [deleted] but if it's true that we have to have 90 and if it's true that it takes 3½ a year to be built to get to 90, then are you saying that it really is relatively unimportant to talk about these cheaper submarines until we get at least to 3½ a year of the SSN-688's? Are you really telling us that?

Dr. MANN. Mr. Chairman, I followed you closely up to the last phrase, unless we get 3½ a year of 688's.

Mr. BENNETT. I'm trying to say if we are not building 3½ 688's a year, then we shouldn't even think about building these cheaper submarines, assuming we have to have 90 subs, because, first of all, you have to have 90 688's, and the only way to get that is to build 3½ a year. So is it your conclusion—I think it follows what you said—that until we get to the point where we're getting 3½ a year on a stable basis there's really no point in considering these inferior submarines?

Dr. MANN. No.

If I could go back to the first point that you made that's what threw me off.

We, the Navy, feels strongly that we must try to achieve a force level of 90 attack submarines. As far as I know, we have not said—perhaps others would say, but I'm not prepared to say—that those 90 must consist of only, or at least to start with, all 688's, because right now we have 594's that are active; we have 637, short hulls that are active; we have 637 long hulls, that are active; and they are going to continue being active until sometime in the late [deleted].

The question is, if we find that we can't increase the one a year building rate for the 688's that because of the cost involved, that in order to get to 90 that we have either to make a major increase in funding in order to do this with 688's or a somewhat lesser increase in funding if we go to a less expensive submarine, then, does a less expensive submarine make sense?

Mr. BENNETT. I didn't really realize that these were to be a substitute for the 688. Now I realize.

Dr. MANN. Complementary to, because——

Mr. BENNETT. No, really. You're now planning 90 and you're going to take out some of those 90 and substitute cheaper ones in place of them. That's not really supplementary. That's a subtraction.

Dr. MANN. If you consider that the whole force would otherwise be 688's and that we stop at, say, 35 or 37 688's and then fill in with the smaller submarines, then you're right, it is a subtraction.

Mr. BENNETT. All right.

I yield back, Mr. Dougherty.

Mr. DOUGHERTY. That's a good point, Mr. Chairman, because under our current building rate we're building one submarine a year. If we take your charts, we save 30 percent. That means we can build four of these submarines, whatever they're going to be, every 3 years.

Dr. MANN. SSN–X.

Mr. DOUGHERTY. So by the year 2000 we will only have built [deleted] additional submarines over and above what we would have built if we build 688's.

Dr. MANN. Yes.

Mr. DOUGHERTY. And we'll still be at significantly less than the 90. So therefore we ought to opt to get the best submarine, if we're going to have a fleet of [deleted] SS or 688's or [deleted] significantly numbered the SSN–X, I think we would be better off to test all [deleted] boats and go with the best ship we can get.

To go back to my other questions.

I think the point at least that I got out of your presentation was the use of an inferior boat in a strategy of barrier. I don't believe the barrier strategy works in either a conventional or a nuclear conflict. So I think then you're talking about submarine against submarine.

You're talking about the open ocean. You're talking about an American boat on patrol in a given part of the Pacific or the Atlantic, going up against a Russian boat that's in that same area, and who's going to win. I think, therefore, you have to address the capability of the individual boat.

You made a comment that acoustics are bad, that 40 percent of the time acoustics are bad.

Would you explain what you meant by that? Is it 40 percent of the year that acoustics are bad, or what? I'm not a technician, so you're going to have to help me out on this.

Dr. MANN. On the average, the acoustic characteristics of the ocean, for example, in the North Atlantic vary considerably with the season. There are changes in the ocean that affect the way in which sound will propagate, and in some circumstances, for example, in the summertime if the ocean is relatively quiet and if you are in a region which is relatively shallow, where you have a relatively shallow surface layer, acoustic propagation may not be very good. On the average, taken on the many years of measurements and experience, on the average acoustic propagation is likely to be bad about 40 percent of the time, and quite good about 40 percent of the time, and somewhere in between about 20 percent of the time.

Mr. DOUGHERTY. Is that 40 percent of the time pretty much confined to a given part of the year?

Dr. MANN. A large part of the year, yes. It's everything except in winter.

Mr. DOUGHERTY. The Russians, obviously, would know then, and let me be hypothetical, that between December and April is that 40 percent when acoustics are bad. If I understand what you're saying, Mr. Secretary, then a Russian submarine that makes more noise may be more difficult to detect during 40 percent of the time when the acoustics are bad.

Dr. MANN. True.

Mr. DOUGHERTY. So, in effect, we have negated our advantage on acoustics in the sense of our ability. Let me say we have negated our advantage in sensors because we are less able to detect the noisier Russian submarine.

Dr. MANN. There's a balance here. It simply means that we can detect him, but we have to come in a little closer. However, what affects us also affects him. That means that we can come in closer before he can counterdetect us. It doesn't mean that we have given up an ability to detect him. It simply means that instead of being able to detect him, [deleted] we might have to come in [deleted] to do so.

Mr. DOUGHERTY. And, of course, the closer you come in to him the greater his likelihood is of picking you up.

Dr. MANN. No. The same acoustics affect him as affect us, and so, if we have to come in closer to find him, he in turn has to have us come in a lot closer than we would otherwise have to come for him to detect us. It simply means that the range over which these detections are occurring is shortened, but we still retain the same relative advantage.

Mr. DOUGHERTY. What you are saying basically is you can still detect a Russian submarine during this bad 40 percent of the time.

Dr. MANN. Oh, yes.

Mr. DOUGHERTY. But you have to do it in closer.

Dr. MANN. Yes.

Mr. DOUGHERTY. Let me ask you this: How long ago did the United States know that the Russians were building a [deleted] submarine?

Dr. MANN. Let me now put on one of my other hats.

The key word in your question is "know." We've suspected, [deleted] for some time.

Mr. DOUGHERTY. What is "some time"? Let's get specific.

Dr. MANN. Oh, [deleted] anyway. I don't remember exactly now. And it's open to argument whether, at the time when we first began to get indications, we felt confident enough to attribute what we knew to [deleted] I think, even today, we don't have what I would call hard, hold in the hand evidence [deleted]. But that's the only way of explaining the intelligence.

Mr. DOUGHERTY. We've had testimony before this committee where it was said that they were working on a [deleted] submarine, and somebody else testified that there are [deleted].

Mr. MANN. That's true.

Mr. DOUGHERTY. It was also testified that it would take the United States 10 years to build a [deleted].

Dr. MANN. I have trouble with that one.

Mr. BENNETT. Do you mean you think we can build it quicker?

Dr. MANN. Oh, no.

Mr. BENNETT. Oh, you don't think we could build it that quick?

Dr. MANN. No.

Mr. DOUGHERTY. What you're opting on is the word in the intelligence game is, I guess, "indicators," and in response to a question of, I think, Mr. Emery, or somebody, you said we have not seen a submarine [deleted].

[Deleted] so it's all a potential.

I would say to you that we have to opt on the side that that potential is more real than less real because up until 4 or 5 years ago we didn't think you could build a submarine [deleted] and all of a sudden the Russians have [deleted].

Dr. MANN. I agree with you.

Mr. DOUGHERTY. So it seems to me that when you look at the overall picture the thrust and the direction of the Soviet Navy is indeed to [deleted] submarines that will go faster and deeper, and this comes to the question of the torpedo, which Mrs. Byron asked you about.

It's been testified previously to this subcommittee that it is conceivable that a [deleted].

Dr. MANN. I don't believe that.

Mr. DOUGHERTY. No? OK.

I created a situation where a Russian submarine [deleted] can go, and it was set at this margin. I believe the maximum depth of the M–48 is a little bit [deleted]. I may be wrong. I don't remember the specifics. And the submarine can maybe go [deleted] or whatever. But it was clearly testified before this subcommittee that it is potentially possible that the MK–48 torpedo [deleted] submarine [deleted] and I think that's another thing we have to be concerned about because the whole point of getting a submarine down in the first place is the ability of the submarine to kill the other submarine, and it seems to me that

depth and speed become very key factors. Because if you have a submarine that can go deeper than [deleted] then your whole submarine is meaningless. We're building submarines we're never going to be able to use, and I have to opt on the side of the Russians in saying that I think that we've got to call the shots.

Mr. BENNETT. We'll ask Admiral Griffiths to answer that question because that really is an operational question, and we don't have any real evidence on it. In other words, some people did tell us that it was a fact that the [deleted] and here today you've given us a contrary opinion. You can get together with Admiral Griffiths or somebody, and when we do have him before us he can give us his best judgment.

Dr. MANN. I think though, Mr. Chairman, if you'll permit me, I need to clarify for Mr. Dougherty both his question and my comment in response to it.

First of all, one does not know [delted] but based on all of the evidence it seems fairly clear that it can get down [deleted]. But that's sort of at the limit. Operating depths are probably [deleted].

There is at the present time little question in my mind that an MK–48 torpedo, advanced capability version, which is programed——

Mr. DOUGHERTY. These are current.

Dr. MANN. You mean what's in the fleet today?

Mr. DOUGHERTY. Yes.

Dr. MANN. There's no ad cap in the fleet today, no advanced capability version.

Mr. DOUGHERTY. But the Russians have [deleted].

Dr. MANN. That is quite correct.

Mr. DOUGHERTY. I'm just trying to be specific. Go ahead.

Dr. MANN. The advanced capability MK–48 will [deleted].

Mr. DOUGHERTY. I asked this question before. I'd like to ask it of you.

Have you ever run tests where you have exploded an MK–48 torpedo [deleted].

Dr. MANN. Not that I know of, but perhaps Mr. Cann knows. In any case, I can easily find out and supply it for the record.

Mr. DOUGHERTY. I'd like that, because what you're saying, in effect, is we don't think they can go any deeper, and if they don't go any deeper we think our torpedo would work, but we have never fired [deleted]. That's what I'm trying to get across.

Dr. MANN. I'll supply that for the record.

Mr. DOUGHERTY. Yes.

[The information to be provided is as follows:]

[The information requested has not been received at press time.]

Mr. DOUGHERTY. The last question I have, Mr. Chairman, if I may, deals with the factor of speed.

An *Alfa* boat [deleted]. I don't want to talk about antimissile capability. Let's just talk about launch capability—and you've got a 688 on escort duty with a carrier task force and you've got an *Alfa* that's standing some distance off. Is it not potentially possible that the *Alfa* can launch its missiles, its cruise missiles, or whatever it would be carrying—I may be wrong on the weaponry naming—but the problem I'm trying to get at is ability of the *Alfa* to launch a weapon against a carrier task force and then retreat faster than our submarines can get to it.

Dr. MANN. If he is not heard, that is, if we don't know he's there. so to speak, and we give him credit for being able to lob a weapon of that sort, [deleted] then the answer to your question is of course he can do it.

Mr. DOUGHERTY. I guess what I'm really trying to get at is the factor of speed and the potential of the Russians coming up with something we never thought they could come up with, [deleted] and I think we've really got to start looking at what are they going to be bringing on line in the 1980's and 1990's. With a tremendous speed advantage, they have to be thinking of—they're plainly not blind—they have to be seeing speed as an advantage in their strategy to attack our carrier task force and to be up against their own submarines. They're working on something.

I guess what I'm suggesting to you is that I find it difficult to accept a direction for the U.S. Navy which totally goes contrary to what I see as what the Soviets are probably doing in their naval strategy.

That's all I have, Mr. Chairman.

Mr. BENNETT. I think we'd better adjourn now—it's 20 to—unless someone has something very pressing.

[No response.]

[Whereupon, at 12:40 p.m., the subcommittee adjourned.]

HOUSE OF REPRESENTATIVES,
COMMITTEE ON ARMED SERVICES,
SEAPOWER AND STRATEGIC AND
CRITICAL MATERIALS SUBCOMMITTEE,
Washington, D.C., Monday, October 22, 1979.

The subcommittee met, pursuant to notice, at 10 a.m., in room 2216, Rayburn House Office Building, Hon. Charles E. Bennett (chairman of the subcommittee) presiding.

Mr. BENNETT. The subcommittee will come to order.

This morning we are pleased to welcome Vice Admiral Griffiths, the Deputy Chief of Naval Operations for Submarine Warfare, to continue in our hearings on new submarine designs for the future.

Admiral Griffiths, your prepared statement is before the subcommittee and will be submitted for the record. You may proceed with your testimony as you see fit.

I would observe that there is a possibility that we may not have a quorum for the purpose of going into executive session and if that developed and we don't have enough people to go into executive session, we could go into a briefing in executive session.

So you can proceed now in open as far as you can go and if you don't feel you can go anywhere at all, we will go into a briefing. I will leave it up to you.

WRITTEN STATEMENT OF VICE ADM. CHARLES H. GRIFFITHS

Mr. Chairman, members of the House Armed Services Seapower Subcommittee: I am Vice Admiral Griffiths, the Deputy Chief of Naval Operations for Submarine Warfare. It is a pleasure for me to appear before you today to discuss the submarine alternatives study.

With me I have Rear Admiral White, my Assistant Deputy Chief of Naval Operations for Submarine Warfare; Rear Admiral Burkhardt who is my Director of the Attack Submarine Division; and Rear Admiral Webber, who is Deputy Commander for Submarines of the Naval Sea Systems Command.

The Submarine Alternatives Study has been released to Congress by the Secretary of Defense. At this time, I will review with you the study charter and salient points of the preparation and report of the study as they concern attack nuclear submarines.

The Secretary of the Navy's task statement directed attention to option which offer the prospect of significantly reducing cost while retaining operational adequacy. The Secretary directed that emphasis be placed on relatively near term, well demonstrated technology options compatible with early ship availability and which would allow high confidence decisions.

From the issuance of this tasking on May 22, 1978, the Navy has worked closely with the study group to develop conceptual SSN designs, prepare acquisition and life-cycle cost estimates, to assess mission and cost effectiveness for comparison of the candidates, and to prepare the final report.

In the study three basic submarine sizes were considered in the conceptual designs. These submarine concepts were nominally [deleted] submerged displacement. Each had a propulsion plant different in power from the others and each differed from the others in cost and speed characteristics. This vugraph shows the range of candidates considered with the SSN 688 class shown as a baseline.

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During the course of the study sixteen conceptual SSN designs were examined with many variants, all stemming from these three basic designs.

Another variable was weapons load. Each candidate was designed to accommodate [deleted] weapons, [deleted] varied also was [deleted] not varied was the sensor suite capability. Near-term, low risk improvements [deleted] were attributed to each SSN in order to ensure our advantages over the Soviets in these areas are maintained.

The [deleted] candidate studied was fundamentally an improved 637 class SSN. There 39 submarines of this class operational today. They represent a mid-1960s technology base. This candidate was examined in the study, [deleted].

The [deleted] candidate was a hybrid design using features of the SSN 688 class [deleted] whereas, the [deleted] design evolved directly from the 688 class SSN.

This vugraph shows the costs of the principal SSN candidates normalized to the current SSN 688. Both acquisition costs and life-cycle costs are shown. Average follow-ship acquisition costs excluded unique lead ship costs, and averaged costs for a buy of 29 ships. These costs included the costs of basic construction which included the total of contractor material and labor, plus the

costs of Government furnished material such as propulsion and electronics equipments.

Life-cycle costs included traditional operating and support costs such as fleet operations and maintenance, recurring procurement, reactor core procurement, bases and shore facilities, and military personnel—all for a 25-year period.

The SSN candidates were compared in traditional antisubmarine and antiship missions. The antisubmarine missions included fixed and moving barriers, area clearance and vectored intercept. The basis for antisurface task comparison was opposition of a Soviet antisubmarine carrier group. Since at-sea exercises have clearly demonstrated the need for SSN 688 speed in direct support, this task was not analyzed. The study acknowledged also that speed is significant in recovering tactical control in special situations such as contact location errors and tactical misjudgment, and that speed may be shown to be important to the long term effectiveness of SSNs [deleted].

The mission effectiveness findings of the study follow:

[Deleted.]

The candidate SSNs were also compared on a cost-effectiveness basis. The basis for comparison was the cost to maintain equal effectiveness forces in various wartime forward operating theatres. The study found that on the basis of either acquisition or life-cycle costs the [deleted]. When forward area mobility is demanded. If it could be assumed that forward area mobility is of lesser importance, the [deleted] but the [deleted]. In any event, a significant increase over the present SSN building rate would be necessary in order to take advantage of the lower acquisition costs for the slower candidates.

At the conclusion of the Submarine Alternatives Study, it was the judgment of the CNO that none of the candidates reported combined low cost with adequate performance. The Chief of Naval Material was tasked, therefore, to take a fresh look at developing an SSN conceptual design to satisfy only top level requirements, with emphasis on achieving significant cost savings from the SSN 688 class.

The Naval Sea Systems Command was challenged to use a [deleted] candidate baseline on which to apply all possible speed and performance enhancements. In parallel with this design, the Chief of Naval Material was tasked to undertake reengineering of the 688 class SSN to capitalize on the excellent baseline characteristics of this ship with application of further hydrodynamic improvements and cost reduction considerations. Both of these design studies are nearly completed and operational effectiveness analysis is now in progress. The results are to be reported to the CNO this fall. The results of these studies will all receive careful consideration. From these deliberations, the CNO is expected to recommend to the Secretary of the Navy a new fleet attack submarine for authorization [deleted].

STATEMENT OF VICE ADM. CHARLES H. GRIFFITHS, U.S. NAVY, DEPUTY CHIEF OF NAVAL OPERATIONS FOR SUBMARINE WARFARE, ACCOMPANIED BY REAR ADM. S. A. WHITE, ASSISTANT DEPUTY CHIEF OF NAVAL OPERATIONS; REAR ADM. L. BURKHARDT III, DIRECTOR, ATTACK SUBMARINE DIVISION; REAR ADM. C. R. LARSON, DIRECTOR, STRATEGIC SUBMARINE DIVISION, OFFICE OF THE DEPUTY CHIEF OF NAVAL OPERATIONS; AND REAR ADM. J. H. WEBBER, DEPUTY COMMANDER, NAVAL SEA SYSTEMS COMMAND

Admiral GRIFFITHS. All right, sir.

Mr. Chairman, Mr. Emery, it is a pleasure to appear before you today to discuss the submarine alternative study.

With me I have Rear Admirals White and Burkhardt from my staff and Rear Admiral Webber, who is the Deputy Commander for Submarines of the Naval Sea Systems Command.

I welcome this opportunity to talk to you about this issue since it is technically detailed and subject to some interpretation.

Let me review quickly for you how we arrived at where we are today.

In response to the Congress, the Secretary of the Navy commissioned the submarine alternative study in May 1978 and in April 1979 it was completed and forwarded to the Secretary of Defense.

At the conclusion of the study, the Chief of Naval Operations judged that none of the candidates combined low cost with adequate performance. In other words, it was clear that because of the lesser capability of the lower speed candidates, a significantly increased SSN building rate would be required, thereby canceling out the advantage of their lower acquisition costs. Consequently, he directed the Naval Sea Systems Command to develope a conceptual submarine design which would combine significant cost savings with adequate performance. These efforts are still in progress.

Admiral Webber and I have submitted statements for the record. I would like to point out, however, that it is important to remember that these studies cannot represent all of the realities that exist in submarine operation and construction. They are, therefore, subject to considerable interpretation and we are here today to provide our experience to assist you in understanding this issue.

Almost everything that I have to say is classified and so I would request that we do go into a briefing in executive session at this time if it meets with your approval, sir.

Mr. BENNETT. Therefore we will go into the status of a briefing.

It will be executive at this point.

Next Monday we will go into a hearing to further extend these hearings.

At this point it will be a briefing so those who are not qualified to sit here under our previously established guidelines will absent themselves.

It is all clear. OK.

Admiral GRIFFITHS. Mr. Chairman, it may be useful to review at this time the four principal candidates in order to refresh your memory.

SSN CANDIDATES

	REENGINEERED SSN 637 (1a)	HYBRID (2a)	BASELINE SSN688 (3)	REENGINEERED SSN688 (3a)
SUBMERGED DISPLACEMENT (TONS)	D	D	6933	D
MAXIMUM SPEED (KTS)			D	

Candidate 1A, the reengineered 637, and candidate 2A, the hybrid, which uses a [deleted] reactor and is a little faster. The 1A is about two-thirds the cost of the baseline submarine whereas 2A is about 84 percent the cost of the baseline submarine. Then, of course, there

are the baseline 688 and the reengineered 688, which have the same [deleted] improvements as 1A and 2A. Those are the four candidates.

Mr. BENNETT. How much more expensive is the reengineered 688?

Admiral GRIFFITHS. The reengineered 688, on a follow-ship cost basis, should be roughly the same cost as the 688.

It is the view of the CNO that the Submarine Alternatives Study was a good effort. It was a very complete effort. The members of the CNO staff, as well as members of the Material Command, participated fully in the conduct of the study. Nevertheless it is most important for you to understand that like all studies, there were limitations to what could reasonably be analyzed.

The candidates were analyzed in the individual submarine tasks, as Dr. Mann mentioned, of fixed and moving barriers, vectored intercept, area clearance, and antisurface warfare.

Cost effectiveness was analyzed, both with flexible tasking, which is most like the real world, and which I will discuss in detail later, and static tasking, which presupposes that we know how and where the Soviets would fight the next war and precisely what tactics they would use.

There were a number of tasks that were not analyzed, the first of these being direct support of the battle group. There has been some confusion regarding the SSN speed required for the direct support mission. Just to set the record straight on this, experience has shown us that the 688 submarine speed is needed to escort our surface battle groups if their speed of advance is [deleted] greater.

As a matter of fact, there is a significant improvement in what the 688 can do if the SOA [deleted].

Mr. BENNETT. Would you say that sentence again?

Admiral GRIFFITHS. I would say that the 688 speed or speed [deleted] are required to adequately escort in the direct support role a task force that has a speed of advance [deleted].

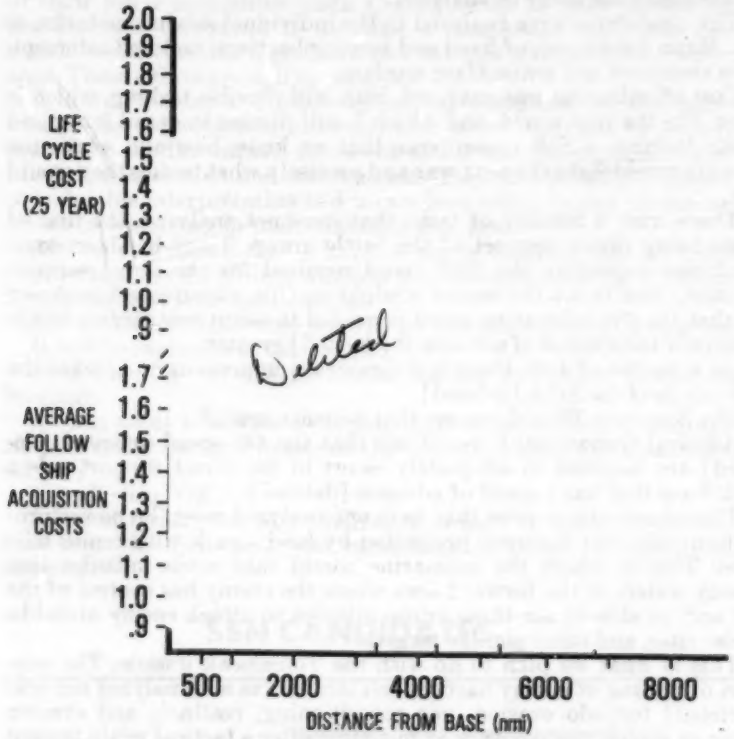
The other tasks or roles that were not analyzed were the power projection role, that is power projection by land attack with cruise missiles. This is where the submarine would take cruise missiles into enemy waters in the forward area where the enemy has control of the air and be able to use those cruise missiles to attack enemy airfields, radar sites, and other similar targets.

This is what we plan to do with the Tomahawk missile. The mission of mining of enemy harbors and straits was not analyzed nor was [deleted] torpedo evasion, nor repositioning, reattack, and evasion after an attack, nor recovery of initiative after a tactical misjudgment such as, for example, finding out that you have been attacking the wrong target in the middle of an attack with the subsequent requirement to recover from that and go after another target.

Now, speed is an important factor in all of these areas that were not analyzed. In fact, the tools of analysis are not sophisticated enough to analyze many of those situations. They just have not yet developed the models that will permit us an analyze adequately such complicated situations, for example, as repositioning, reattack, and evasion after attack.

So I think all of those points are very important preamble to my next comments.

RELATIVE COSTS FOR EQUAL EFFECTIVENESS FORCES vs. DISTANCE FROM BASE (FLEXIBLE TASKING) (MAXIMUM QUIET SPEED)



Next slide, please.

Now, from my point of view, from the point of view of the operator, this is the bottom line slide of the study with respect to the SSN's. It is the flexible tasking situation that Dr. Mann showed to you on the 11th of October during his testimony. It is as close as we can come with analysis to the wartime operations we would be required to perform. In that actual respect [deleted] it makes the most sense to me as an experienced submariner.

What these plots show is the relative cost for equal effectiveness forces versus the one-way distance from our base in Norfolk to various theaters of action. Analysis included a life cycle cost basis which I think of as the actual costs to the taxpayer—all the costs to run the ships over 25 years, including the pay of the people, the food, the

cost to build the ships, and the bases; and an average follow ship cost basis, which is the cost of the 2d through the 30th ship.

When we average the 2d to 30th ship that would be built in the class it shows clearly that the 3 and 3A alternatives, which are the faster alternatives, are also the more effective from both the life cycle cost basis and the average follow ship cost basis. And, as I pointed out, we didn't examine all the tasks where speed is shown to be advantageous which would have further skewed these curves in favor of.

So that is the bottom line and that is what the Secretary of the Navy's alternatives study showed, and that is why it was decided that it was necessary to reexamine the candidates, to go back to the drawing board and to attempt to redesign a more cost effective, cheaper submarine, and that is what the CNO directed the Commander, Naval Sea Systems Command, to do and he has been working on that since.

While that has been going on, of course, [deleted] intelligence on the *Alfa* has been spewing out and that has indicated that we need to look not only at lesser speed candidates, but to look at higher speed candidates as well and so a candidate of higher speed than the 688, as a matter of fact, two higher speed candidates 688 are being investigated in the ongoing analysis. Again there has been some misunderstanding as to what the analysis on the new slow speed candidate shows.

I have looked at the initial results; it would appear that the slower speed candidate which has been called the fleet attack submarine, or the FAS, would come somewhere near matching the 2A in cost effectiveness; that is, it is still not as cost effective as the higher speed candidates. The reason that it would not do much better than that, even though it has a [deleted] top speed, is that [deleted].

The maximum quiet speed for the 2A [deleted]. The maximum quiet speed for the fleet attack submarine [deleted] and that is significant.

Our preliminary look at the candidate that is faster than the 688 shows that it would appear to be better than the 688 from a cost effectiveness standpoint. From my standpoint I have presented the bottom line of the submarine alternatives study and where we are headed I think the analysis that is going on right now will probably bear out what I have told you with respect to the outcome of the faster and the slower submarines that are being looked at in this follow-on study.

Now, I am ready to answer any questions that you might ask, sir.

Mr. BENNETT. Put this thing back on for a moment. I am a little bit confused here about what you said.

Are you saying to me that the 3A, which is the lowest line of them all, is the best cost effective ship when you knock out all these things that the other ships can do? Is that what you are saying?

In other words, the top or the bottom?

Admiral GRIFFITHS. I am saying that the best is at the bottom of the graph. This is relative cost, and to show you what I mean, let's take position 3 here. Let's say we have a conflict in the Middle East. Moving up to this curve you can see that it would cost about 70 percent more to buy the extra number of low-speed submarines or the 1A candidate than it would cost for an equal effectiveness size force of reengineered 688's. That is on a life cycle cost basis. On an

average follow ship cost basis it would be about 25 percent more to buy the extra number of 1A candidates that would be required to do the same job as the reengineered 688 candidate. Is that clear, Mr. Chairman?

Mr. BENNETT. I believe it is.

Mr. Spence, do you have any questions?

Mr. SPENCE. Thank you, Mr. Chairman.

If I understand you correctly, Admiral, the study so far then has just borne out the fact that the 688 is the best submarine and we should improve on that?

Admiral GRIFFITHS. Well, as I said earlier, Mr. Spence, the beauty is in the eyes of the beholder somewhat in this study. In my eyes you are absolutely right, that from the standpoint of the operational experience that I have, and from what I see, this study has shown that it is clearly advantageous in the type of scenarios that I envision we would fight the war, a real war, to have the 688 speed.

Mr. SPENCE. Even to those of us who aren't as experienced as you are, I thought it was pretty apparent that we were being told we should go in a different direction, a less capable submarine, and while the Russians were going in just the opposite direction, we should go forward with our 688 and improve on that because the cost difference, as you brought out here this morning, I think could even be more costly to build a less capable submarine, is that not right?

Admiral GRIFFITHS. In the scenarios that were looked at in the flexible tasking or what I refer to as real world scenarios, that is true.

Mr. SPENCE. We found the same thing to be true with nuclear aircraft carriers, too, I think. Are we going to back and study this thing again?

Admiral GRIFFITHS. We have an ongoing conceptual design effort. We haven't finished completely wringing out the performance of the fleet attack submarine or the faster versions of the 688, the reengineered 688. We really improved the reengineered 688 in this ongoing effort.

We have just recently received the parameters for those ships from the Naval Sea Systems Command. They now have feasibility designs. We are taking the operating parameters from those designs and we are playing them in the same models that we played the study candidates to see how they compare and how they would therefore compare on that same graph that I showed you. It will probably be around the first of December before we finish with the very detailed study that is going on.

Mr. SPENCE. I am concerned, Mr. Chairman, about what you are saying this morning. My only fear is that somebody in those little holes somewhere that we can't find is going to come out with a conclusion and then try to get the Navy to back up whatever conclusion they come out with.

That has been done before and that is what concerns me and I will be looking with a great deal of interest at these ongoing studies to see if they further bear out what you say this morning rather than reach the conclusion we don't want to reach.

Admiral GRIFFITHS. I am not in a position to prejudge the decision that will be made by the CNO and by the Secretary of the Navy and

then by the Secretary of Defense on top of that, but I would think that by shortly after the first of December, when we take to the CNO all the alternatives so he can see them, that he will make a wise decision.

Mr. SPENCE. If you aren't given these certain parameters about some of these little holes somewhere and then you have to come up with something that fits that little parameter; that has been done before. That is what concerns me.

If we consider all the facts that we have to consider, as you have done on this graph you showed this morning, it will be all right, but if they are going to come up with a parameter, say we want a submarine that will cost this much money, and then you do whatever study you want to do but it has to be within that cost figure, then you have a different ballgame. That is what worries me.

Admiral GRIFFITHS. Yes, sir.

Mr. SPENCE. Thank you, Mr. Chairman.

Mr. BENNETT. Mr. Emery.

Mr. EMERY. Thank you, Mr. Chairman.

Admiral, I wonder if you can tell us what reengineering is to be done on this, I guess, 3 or 3A which is the modified 688? What have you done to reduce the displacement and improve the quietness and so forth?

Admiral GRIFFITHS. We have [deleted] the propulsion plant; we have made some improvements in the hull structure [deleted]. We have improved [deleted] and we have improved [deleted].

Those are the principal differences.

Admiral Webber could probably do a better job of filling you in on that, but that is generally it, isn't it, Admiral Webber?

Admiral WEBBER. That is it primarily.

Improvement in efficiency of the [deleted] combination which are the means used [deleted]. The redesign is a combination of acoustic improvements, [deleted] improvements [deleted].

Mr. EMERY. In various categories, such as depth, quietness, maximum quiet speed, and whatever other characteristics are important, how does this modified 688 compare with the 688 we are now building?

Admiral GRIFFITHS. It is [deleted] faster in maximum speed.

Mr. EMERY. The modified 688 is faster?

Admiral GRIFFITHS. Yes. The submarine is [deleted] submarine, so there is a [deleted] speed differential there.

In high quiet speed there is [deleted] improvement or it goes up to I believe [deleted] if I am not mistaken.

Admiral WEBBER. [Deleted.]

Admiral GRIFFITHS. [Deleted] for high quiet speed versus [deleted] improvement in the [deleted] speed, and, as Dr. Mann pointed out to you in his testimony on the 11th, [deleted] and this would be significant; a significant improvement over the effectiveness of the present 688 class.

Mr. EMERY. What about depth?

Admiral GRIFFITHS. It would be [deleted]. It would be a [deleted] depth capability, the [deleted] and it would have a somewhat improved combat system and a somewhat improved quieting over the 688.

Mr. EMERY. So I guess what you are telling me is that the modified 688 is a better submarine than the original 688?

Admiral GRIFFITHS. Much better.

Mr. EMERY. What is the comparison in the construction cost?

Admiral GRIFFITHS. Well, I would say that from what we have learned so far we believe it would be comparable to the 688 cost.

Mr. EMERY. Any significant difference?

Admiral GRIFFITHS. Any significant difference?

Admiral WEBBER. No, sir. Very, very competitive with the present 688.

Mr. EMERY. By very, very competitive you mean no significant difference, but you expect it might be slightly more or slightly less?

Admiral WEBBER. We have not yet completed our final cost analysis of this. We have completed the technical work but not yet completed the final cost analysis.

Mr. EMERY. It seems to me then that if we have a submarine which is quieter, has a greater maximum quiet speed, and has an advantage of [deleted] top speed over the original 688 and we are getting the submarine for essentially the same price, we ought to be building them.

Admiral GRIFFITHS. And I would say that that is a very good deduction, Mr. Emery, and we may well end up doing that. This business has been evolving so swiftly and one of the things I mentioned was that this submarine alternatives study has been a good effort. It has been a good effort because it has pushed us to look at alternatives and it has pushed us in submarine design faster than we were moving. It has permitted, for example, the evolving of these alternatives that I described to you today, but this is all rather recent work done by the Naval Sea Systems Command and at the time of the Secretary of the Navy's alternatives study we didn't even envision that these advances could be forthcoming.

Mr. EMERY. I guess the thing that I am interested in and the reason I raise this point is that I don't think it was readily apparent to most members of this committee during Dr. Mann's testimony that one of the results of the study was actually a submarine which was better than the 688.

I think most members who listened to the testimony assumed that every one of the various submarines that were considered as an alternative in the study were inferior, lower in cost, but were inferior in terms of speed, inferior in terms of maximum quiet speed, and inferior in terms of weapons and the like.

So if in fact this modified 688 is a better machine, I think it is necessary for you to spend a bit more time telling us about the characteristics of the submarine and telling us a little bit about the engineering design that makes it a better submarine for about the same cost, because if in fact the study has shown that is a way to get better submarines for the same price and in fact these characteristics are better, then I think the study has been a success and allowed the Navy to reexamine its current engineering and has come up with better alternatives. That is the kind of thing we really need to do, but I don't think it was readily apparent to all the members of this committee that that is in fact what you have done with this modified 688.

I think we need to know more about that submarine.

Admiral GRIFFITHS. Once again, Dr. Mann needs nobody to speak up for him, because he is very capable of doing it himself, but at the

time that we completed the study we really didn't have any other alternatives that were better than the 688. This has been a follow-on development. I think that perhaps he really wasn't sufficiently aware of it himself at the time he testified and may well have felt that it was too premature to be bringing forth at that time.

Mr. EMERY. Admiral, let me ask you if these modifications can in fact be made on the present 688 design. Do you have any plans for maybe retooling or reexamining the 688's that are on the drawing board or are to be built to incorporate some of those modifications? Is that possible, or is it a much more involved thing?

Admiral GRIFFITHS. It would be more involved than that. The 688's that are authorized to date and under contract to date are well beyond the point where we could make changes of this magnitude to them.

Mr. EMERY. These are fundamental design changes rather than modifications to the system?

Admiral GRIFFITHS. It is essentially putting significant design changes primarily in the engine room of the ship [deleted] that sort of thing. I would not believe we could fit these changes into any of the submarines that are currently under construction or currently authorized.

Mr. EMERY. One final question I would like to ask. There has been a considerable amount of discussion in this committee the last couple of weeks about [deleted] hull systems, some concerns that we haven't been moving ahead faster. Can you tell me a little bit about what the advantages of a titanium hull are?

One of the characteristics was a metal or metal alloy that makes it superior to steel or other alloys, considerably stronger.

Admiral GRIFFITHS. Considerably stronger for the same weight of material. Therefore, a submarine is capable of achieving greater depth with titanium than it is with steel.

Most of the advantages that I see are defensive in nature; it would provide the opportunity to build a stronger hull which would therefore withstand battle damage better.

It would provide the opportunity to go deeper, thereby permitting you to perhaps have a better chance to escape antisubmarine weapons that have been fired at you.

It provides an opportunity for a larger envelope in which to operate without exceeding your depth envelope. Those are the major advances that I see that are capable through titanium.

Mr. EMERY. If you can tell me, what are the alloys? Do you make an alloy with titanium using steel and some other common alloys? You don't use pure titanium?

Admiral GRIFFITHS. No.; it is not pure titanium. It is alloyed with small quantities of other metals, and I would have to ask Admiral Webber to answer.

Admiral WEBBER. Titanium, aluminum, and vanadium are the principal elements of the alloy.

Mr. EMERY. Aluminum?

Admiral WEBBER. Yes, sir.

Mr. EMERY. That would seem to indicate that the overall weight would be a little less. Is the weight of a piece of hull section less with the titanium-aluminum alloy than it is with steel?

Admiral WEBBER. Yes, sir.

Mr. EMERY. That introduces some other problems too because if you have a displacement of so many tons, you are going to have to have a submarine that is capable of diving. It means that you are going to have to counteract the lighter weight with something else, so is the weight question, as far as displacement, a problem?

Admiral WEBBER. As Admiral Griffiths has indicated, the strength-to-weight ratio is a very important factor in deep diving hull material.

In obtaining a very deep diving submarine hull material, you need a high strength-to-weight ratio. You need it strong for the weight of the hull. Otherwise the structural weight taken up by the hull will occupy too great a portion of the submarine weight and you have very little left over for propulsion or payload.

Mr. EMERY. That is exactly what I mean.

Admiral WEBBER. So that in attempting to get a submarine to go very deep you need a very strong material for the weight that is invested in the hull structure itself. Titanium does offer this possibility.

Now, in the case of the [deleted] a very high performance submarine. The submarine is capable, as you have been briefed, of very high speed and going very deeply [deleted] they have been able to design a submarine with such performance.

Mr. EMERY. Do you see any possibility that we might be using titanium technology in submarines of our own in the near future, and, if not, do we have any technological problems that we haven't been able to overcome?

Admiral WEBBER. The qualification of titanium for submarine hull construction as we are proceeding under the present R. & D. program will take [deleted]. So it is [deleted] as far as the development of our technology is concerned.

Mr. EMERY. That bothers me a little bit. Is it that we have consciously made the decision not to do it, or is it that the Soviets have made some technological breakthrough that we don't understand?

Admiral WEBBER. The fabrication of titanium, the welding of titanium, is a very difficult matter. The welding must be done in an inert atmosphere. It is very expensive. In my opinion, the thing that has really controlled the rate at which we have developed titanium has been the cost of development and ultimately the cost of construction.

We presently are estimating that the cost of fabricating a titanium hull could run as much as [deleted] the cost of fabricating a steel hull. So the cost differential has affected the rate of our development.

Mr. EMERY. The development is not new. Aluminum with argon gas is used now.

Admiral WEBBER. Yes, sir.

Mr. EMERY. Many alloys employ the argon or helium in some combination. That is not an unusual technology.

Admiral WEBBER. No, but the difficulty of welding the titanium is. It is different than aluminum. The way we have been able to weld the titanium we have worked with has been in a completely inert atmosphere. It takes different techniques than welding aluminum or stainless steel, so it is really a different degree of difficulty.

Mr. EMERY. What have the [deleted]. They have obviously worked on this problem and have solved it.

Admiral WEBBER. Yes, sir. [Deleted.]

Mr. EMERY. You are confident, however, if we should decide to move into that technology there are no technological blockades that we can't overcome?

Admiral WEBBER. Yes, sir, it would take time and money.

Mr. EMERY. No further questions.

Mr. BENNETT. Mr. Dougherty.

Mr. DOUGHERTY. Thank you, Mr. Chairman.

Admiral, what would be the reason why the [deleted] submarines other than they are faster? We have had prior discussion about [deleted].

Let me back up. Were we taken by surprise, in your opinion, when they came out with the *Alfa*?

Amiral GRIFFITHS. No, not completely by surprise.

[Deleted.]

We were not surprised by the *Alfa*. I think that we were somewhat surprised [deleted]. I think that was a surprise because I don't believe that was expected.

Mr. BENNETT. That has nothing to do [deleted].

Admiral GRIFFITHS. That has nothing to do [deleted].

Mr. DOUGHERTY. The lightness of the submarine?

Admiral GRIFFITHS. It really has to do primarily with the amount [deleted] they have been able to put into that [deleted] hull and it would appear to be about [deleted] which would be [deleted] in a hull of that size.

Mr. DOUGHERTY. What you are saying is, we have really two surprises. One is, they really built the [deleted] hull although you had indications of it being built, but also [deleted] was a surprise.

Amiral GRIFFITHS. That was a surprise.

Mr. DOUGHERTY. How do you anticipate combatting *Alfa* submarines between now and the end of the century [deleted]. How do you combat it?

Admiral GRIFFITHS. The capability that we are ascribing to the *Alfa*, [deleted]. But we are going to have to combat it with the best submarines that we can build and with the best weapons that we can build that will be able to go deep enough and fast enough to counter the *Alfa*. Our combat systems and sensors must continue to let us detect the *Alfa* before he can detect us and let us be able to position him for attack so that we can direct our weapons to him.

I think we are ahead in the area of weapons systems. I think we are ahead in the area of sensors, and so I think that we will have to counter that threat primarily with weapons.

Mr. DOUGHERTY. Yes, but let's be realistic. The Soviets obviously are not dummies and suppose they address the problem of acoustics. Suppose they come up with an *Alfa* that is extremely quiet. You have yourself another problem that even your best submarines can't handle.

Admiral GRIFFITHS. That would be true.

Mr. DOUGHERTY. We are really saying we are offsetting the *Alfa* by our tactics and by some of the technical innovations as far as weapons and acoustics.

But let's break it down.

1. If they ever get to the point where they come up with submarines that are acoustically quiet, we have a major problem.

Admiral GRIFFITHS. Correct.

Mr. DOUGHERTY. Isn't it also true though that when you are dealing with the *Alfa* you have a real problem in that if a 688 picked up an *Alfa* coming straight at you, you have one problem which you can handle with a speed differential, but if the *Alfa* is going away from you or in the opposite direction or whatever, you have a problem catching up with it and it would be a matter of placing a submarine some place else to pick it up.

Admiral GRIFFITHS. That is correct, unless we could lob off a standoff weapon to get it.

Mr. DOUGHERTY. Let's talk about the fact that SUBROC's are going out of service. What are we going to replace them with?

Admiral GRIFFITHS. With the submarine standoff weapon.

Mr. DOUGHERTY. When are we going to have that?

Admiral GRIFFITHS. [Deleted.]

Mr. DOUGHERTY. [Deleted] and when are the SUBROC's going out?

Admiral GRIFFITHS. They will be phasing out [deleted].

Mr. DOUGHERTY. Well, that to me is [deleted] you are talking about [deleted] really [deleted] the submarine standoff weapon?

Admiral GRIFFITHS. Well, we still have some SUBROC's but in essence you are right.

Mr. DOUGHERTY. How many operational submarines will we have in 1987 under our current building schedule?

Admiral GRIFFITHS. By 1987 we will be [deleted] submarines.

Mr. DOUGHERTY. And that would be a total submarines force [deleted]. At any given time how many of those submarines would be in for overhaul, repair, or just normal maintenance?

Admiral GRIFFITHS. About 30 percent would be in overhaul or undergoing normal maintenance.

Mr. DOUGHERTY. The other day, Admiral, somebody testified—I guess Secretary Mann, that in time of maximum alert, we would have to put [deleted] ships to sea, and I guess the question I am raising is, that if we are coming down in the late 1980's on the number of submarines available, yet our requirements are still that we have [deleted] ships available for maximum alert, not only do we have an inferior submarine, we don't have enough of them.

Admiral GRIFFITHS. Well, you won't have an argument with me on that subject, Mr. Dougherty, but I read Dr. Mann's testimony and I had the impression that he pointed out that that number [deleted] and the number of dots on that chart was symbolic and not necessarily the number that we expected to have at sea.

Mr. DOUGHERTY. I asked him the specific question. I said, at a time of maximum alert, how many submarines could we get to sea [deleted].

Admiral GRIFFITHS. That is correct. [Deleted] a pretty good number. The point is, do you have to get [deleted] to sea at that time, and that was the question that I was getting at, and that is somewhat subjective.

Mr. DOUGHERTY. The point I am getting at is, one, the inferior submarine perhaps as it relates to an *Alfa* and two, numbers.

The third point I am trying to make is that the whole purpose of going to sea is to be able to destroy the enemy submarine and at the present time we have a torpedo and we have to [deleted] to get the enemy submarine.

My concern is, how quickly that torpedo is going to develop, the light weight torpedo. The second concern is the [deleted] that probably comes with standoff weapons [deleted] and the third, how could you deal with *Alfa* or are we aware of any kind of counter torpedo measures being developed by the Soviets?

If you get the 688 [deleted].

Mr. DOUGHERTY. Unless, of course, the Russians, [deleted] develop some kind of ability like making the *Alfa* more quiet or being able to take it deeper than you anticipated it operating at or else come up with an antitorpedo weapon.

Admiral GRIFFITHS. There are improvements, of course, that they could make. Making them more quiet won't help a lot in this thing that we are talking about because it is primarily their [deleted] on [deleted].

The surprise element is a very important element [deleted.]

Mr. DOUGHERTY. How many targets can a 688 engage at any one time?

Admiral GRIFFITHS. They can engage——

Mr. DOUGHERTY. At the same time.

Admiral GRIFFITHS. At the same time certainly [deleted].

[Deleted.]

Admiral GRIFFITHS. At the present time, today, right now, [deleted].

Mr. DOUGHERTY. Would you feel more confident [deleted].

Admiral GRIFFITHS. I will feel somewhat more confident [deleted] yes, quite a bit more confident.

Mr. DOUGHERTY. Why?

Admiral GRIFFITHS. Because [deleted] we will have completed, [deleted] the necessary changes [deleted] to be able to [deleted].

We will have significantly greater capability when we put our advance capabilities improvements into the [deleted] and the date that we get those in is bit problematical.

Right now we are counting on that date [deleted] but we hope to accelerate that date somewhat. At that time we should have a fairly high probability of [deleted].

Mr. DOUGHERTY. So that in effect you could be shooting at [deleted] enemy subs at the same time?

Admiral GRIFFITHS. Yes.

Mr. DOUGHERTY. Is the element of surprise lost, and obviously it is to an extent, but when you fire your torpedoes are you then more likely to be located by the enemy or less likely or what?

Admiral GRIFFITHS. You are more likely to be located by the enemy, of course, [deleted].

Mr. DOUGHERTY. I have four Russian submarines in the area and you have one 688. I think I am being generous to you by giving you 4-to-1 odds. [Deleted.]

Admiral GRIFFITHS. Yes.

Mr. DOUGHERTY. I think the Russians look at their submarines to a degree as being expendable and the point I am getting at is that the numbers, and you talk quality, but at some point in time quality and quantity—it gets to the point——

Admiral GRIFFITHS. I absolutely agree.

Mr. DOUGHERTY. What I am getting to I guess is this idea that while our numbers are diminishing, even though they are quality submarines, the Russian numbers are increasing and they are developing a quality submarine.

Maybe it is not as quiet as ours, maybe not as sophisticated as ours, but maybe they can lose two of theirs just to take one of ours.

Let's say that is their grand strategy or let's talk about the gaps to keep the Russians from coming into the Atlantic. If the Russians decide to send the submarines through the barriers, or gaps, or whatever you want to call it, what would you do about it if they decide to send them into the Atlantic?

Admiral GRIFFITHS. You mean prior to starting?

Mr. DOUGHERTY. They announce they are going to have extensive naval exercises in the North Atlantic and they are sending all their submarines into the Atlantic.

Admiral GRIFFITHS. We would probably do just the best we could to keep track of what they are doing.

Mr. DOUGHERTY. So once they are into the North Atlantic, what is your capability to deal with them?

Admiral GRIFFITHS. It is fairly significant in using the flexible tasking that we actually——

Mr. DOUGHERTY. OK, flexible tasking. You mean using your fleets in different locations?

Admiral GRIFFITHS. Yes.

Mr. DOUGHERTY. In other words, if we have a battle in the Mediterranean and bring those same ships in——

Admiral GRIFFITHS. No.

Mr. DOUGHERTY. What is the flexible tasking?

Admiral GRIFFITHS. I am saying [deleted] provide the maximum amount of flexibility to suit the situation. [Deleted] we are ready to take on the problem as it develops, whatever it may be [deleted].

[Deleted.]

Mr. DOUGHERTY. The point I am making though is that the most difficult kind of an operation that the American submarine Navy has would be an open ocean war, and when we have talked about this effectiveness in the study that was being developed by the Navy as an alternative. No. 1, we were going to have a better air strategy; two, we were going to have intercept and then we were going to have task intercept and all that jazz. What I am suggesting to you is with the maximum number the Russians would be able to put in the North Atlantic, you are not going to have enough forces to either get all of them or to escort the carriers.

I am just offering a suggestion. I am not trying to ask you tough questions.

I am trying to get you on record. The fact of the matter is, I don't know how you can knock them out of a five-phase mission with the American submarine Navy once the Russians are in the North Atlantic with the numbers game being probably what it will be in the late 1980's.

Admiral GRIFFITHS. There would be significant risk.

Mr. DOUGHERTY. Significant risk?

Admiral GRIFFITHS. Yes.

Mr. DOUGHERTY. May I ask one last question, Mr. Chairman? Has anybody given any thought to what tactics the Russian Navy would use, and particularly in light of this massive ship they are building apparently, a 32,000 ton battleship somebody has come across, some massive surface ship that has been built?

Admiral GRIFFITHS. I would say we have given some considerable amount of thought as to how they would.

Mr. DOUGHERTY. What are your tactics in a battle in which the Soviets have a super surface ship plus the *Alfa* class submarines?

Admiral GRIFFITHS. I think we would go after it in a very similar fashion. If that super battle cruiser were put out into open ocean, it would be a very prime target for our naval air, for one thing, and it would be under considerable risk.

Mr. DOUGHERTY. For whom?

Admiral GRIFFITHS. To that battle cruiser.

Mr. DOUGHERTY. The Russians are building it not to use it as a museum in Leningrad. They are building it to obviously use it some place, and it would seem to me that ship is too big to use in the Baltic.

Admiral GRIFFITHS. I would think it probably is.

Mr. DOUGHERTY. So obviously they are going to bring it out and if they bring it out, plus the class of submarines they have, plus obviously air power, they are not going to leave that thing out like the *Bismarck* was in 1940. Are we really equipped from your submarine point of view to handle that massive Soviet naval presence?

Admiral GRIFFITHS. I think that we are quite well equipped, yes, I really do. I think we would sort of lick our chops at that target, if I may say so.

Mr. DOUGHERTY. At the same time you are chasing Russian submarines all over the place?

Admiral GRIFFITHS. We would be [deleted] but I don't think that surface ship would bother us very much.

Mr. DOUGHERTY. I am not talking about bothering you, but I am talking about as it relates to one of your missions and that is your task force.

Admiral GRIFFITHS. Would it be a bother to our task force?

Mr. DOUGHERTY. Yes.

Admiral GRIFFITHS. I don't really think so.

Mr. DOUGHERTY. You think they are just wasting their money in building it?

Admiral GRIFFITHS. No, I don't think they are wasting their money. I think it would be a very significant threat, but I think that we would be ready to take it on with our surface battle group.

Mr. DOUGHERTY. Thank you, Mr. Chairman.

Mr. BENNETT. Mrs. Byron.

Mrs. BYRON. No questions.

Mr. BENNETT. Several things surfaced in the conversation which I would like to pursue for a moment.

One of the things is, would our policy be to use atomic, nuclear "tactical" weapons against that ship?

Admiral GRIFFITHS. That would be once again a political question more than a military question, Mr. Chairman.

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I think we certainly have the capability to do that.

Mr. BENNETT. I understand. The reason I am pursuing this is really something tangential to what we are now studying and maybe there ought to be other hearings on it if we have time for other hearings.

I have given some thought to what I have read, I believe I have read, about the Russians' attitude toward using atomic weapons against our carriers and other sizable surface ships. My understanding is that they expect to do that. That being the case, what is our response to that? How are we going to protect those ships of ours?

Admiral GRIFFITHS. I think that we would protect them, Once they had used tactical nuclear weapons we, of course, would use those that we have as well, but would certainly complicate the battle significantly if they were——

Mr. BENNETT. Do you see going into a nuclear war then at that point? It has concerned me some when we talk about tactical weapons.

Admiral GRIFFITHS. I think there is always the potential of going to a nuclear war.

Mr. BENNETT. It has concerned me that I believe the Russians have said that that is what they would do to our surface ships and we have said that we would use tactical weapons to deter an overrun on land in Europe, short of a nuclear war, and, of course, I don't know whether it can be short of a nuclear power war. I would think in either case you would get into a nuclear war pretty quick. But that does concern me a lot because of course the fact that we could wipe out some of their ships, that one ship or maybe a few others, by tactical weapons doesn't mean that we are in a very good place because if we have our large surface ships sunk by atomic weapons, we in fact have become much less of a factor in saving Europe.

I don't know. Do you think this is something we ought to have hearings about sometime or not, or is this an unthinkable subject?

Admiral GRIFFITHS. It might be worthwhile to pursue that subject further, Mr. Chairman. I would hope that you would do that with someone better qualified than I.

Mr. BENNETT. You are very modest. You are not the person I should be asking these questions to, but maybe I have some that I should be asking of you.

One is, what is the status of the improved SSN 688 design? Could you expect to see it in the 5-year plan?

Admiral GRIFFITHS. Yes, sir, we could see that in the 5-year plan, very definitely.

Mr. BENNETT. What is the current status of putting land attack cruise missiles on attack submarines?

Admiral GRIFFITHS. It is under review; that is, we are currently examining—two things. I have gotten ahead of myself a little bit.

We are looking at the possibility of [deleted] the current 688 design and [deleted] the other candidates that we are looking at in the submarine alternatives study. We, of course, have the capability and have plans to put the land attack, both conventional and nuclear, into our submarine hulls and we can, of course, fire those from torpedo tubes [deleted].

We are building a capability into our fire control systems to fire cruise missiles and plan to do so. We have a program, an active, on-

going program, to put the antiship Tomahawk aboard our submarines, which is progressing along, as you well know.

We are in the R. & D. phase with respect to putting the conventional or the land attack Tomahawks aboard our submarines and surface ships. Hopefully those programs will work out, and we certainly are counting on them working out because it would be a tremendous improvement to the firepower of both our surface ships and our submarines to be able to put a large number of cruise missiles like the Tomahawk aboard.

We plan to do that.

Admiral WEBBER. I might add, Mr. Chairman, under tasking from the CNO, we have been looking at the installation of cruise missiles [deleted] and it now appears to be entirely feasible at a very modest impact on the ship.

Mr. BENNETT. I want to repeat I think all the members know why we are doing what we are now doing, why the Navy is doing it and why the committee is doing it, but it might be worthwhile repeating.

A year or so ago in our efforts to get good combatant ships for the Navy, we hit a nerve in the number of ships which was expressed by various Presidents and also by Senator Hart on the Senate side, so he had before our conference the thrust for smaller, cheaper ships to get more numbers, and we got language in the report that the conference agreed to, to look at this possibility of having more numerous, cheaper ships, which was a part of an agreement between the House and the Senate that we would still build some good ships while we are looking at the others.

That is really, I believe, the foundation for this kind of study we are having here today. We certainly don't want to close our minds to getting good weapons in the way of ships that are cheaper. The study you made has been productive because you looked at it and you developed some other things that were helpful and that is good.

Now, there is one little facet of this that I guess you can address and that is, is there any payoff in the Trident submarine? In other words, the Trident really doesn't have to go that fast, as I understand it, and so speed is not quite as essential in a Trident submarine as it is in another submarine.

Is there anything you have discovered in this that will have any bearing on future Tridents that will save money by going slower?

Admiral GRIFFITHS. I think we may have learned some things from this study that would have us look very closely in that direction, and we plan to do that and are doing it, sir.

We are considering feasibility designs of a less costly replacement SSBN to the Trident and we would intend to study and determine whether it would in fact be cost effective to build a cheaper replacement for the SSBN. Of course, it takes some time to do this and the first year that we probably would be able to authorize that follow-on SSBN, or request authorization for it, would be somewhere [deleted].

Mr. BENNETT. Of course, I am not necessarily pushing. I would like to have every ship as perfect as can be, but I think you can't close your minds to places where you can save money and be almost as effective and in the end be more effective because you can get more ships.

It is something we ought to try to do if we can.

Admiral GRIFFITHS. I agree completely, Mr. Chairman, and this problem of affordability that the Navy faces is a very significant problem. We need ships across the board and we need airplanes and in an effort to do this we do need to look at the affordability. I think it is very important.

Mr. BENNETT. Mr. Hale?

Mr. HALE. Admiral Griffiths, would the loading of the [deleted] system in the attack submarines impair or degrade the current weapon loading [deleted] and its numbers or would this be additive?

Admiral GRIFFITHS. It would be additive. It would not impair it in any way. It would increase the firepower of the ship significantly.

Mr. HALE. Would you envision [deleted].

Admiral GRIFFITHS. We would envision [deleted]. We are in the process of redesigning that, anyway, in improving that structure for produceability and for a savings in cost and it is an ideal time to design [deleted].

Mr. HALE. Now, where are the resources in the budget right now for this program? Is this an R. & D. effort or where is it and how much money is in there?

Admiral GRIFFITHS. There is nothing in the budget for it right now and it is R. & D.

Mr. HALE. How are we going to do it? Is it going to be in the 1981 request?

Admiral GRIFFITHS. It may well be in the 1981 request.

Mr. HALE. If it is not in the 1981 request, then the IOC would, of course, slip correspondingly well downstream.

Admiral GRIFFITHS. That is correct. We intend to bring this whole thing to a head at the same time that we make the decision on the SSN that we are going to build for the future.

Mr. HALE. Thank you.

Mr. BENNETT. Mr. Mollohan?

Mr. MOLLOHAN. I have no questions, Mr. Chairman.

Mr. BENNETT. Mr. Spence?

Mr. SPENCE. I have a few short questions to raise in our discussion. Admiral, did you say two higher speed candidates?

Admiral GRIFFITHS. Yes, Mr. Spence. We are looking at a design which would use the same principles that were used in designing the fleet attack submarine; that is, to develop the best [deleted] to provide the most speed advantage. If we were to do that, we would end up with [deleted] hull and put the [deleted] and make the same other improvements that we made in noise quieting and in the combat suite.

We could build that ship and it would probably go a little faster even than the reengineered 688 that I was referring to [deleted] and it would be a major redesign to do. But it is one of the alternatives that we are looking at and one of the alternatives that we will be checking out in our models and in the study.

Mr. SPENCE. Along that line, I think you said that we will know the results of the continuing study sometime in December, is that right?

Admiral GRIFFITHS. That is what we expect, yes, sir.

Mr. SPENCE. Are you at a place where you can tell us what your decision would be?

Admiral GRIFFITHS. I have not arrived at that place where I want to go on record as saying what my recommendation would be.

Mr. SPENCE. The decision will be made by the Navy when, do you think?

Admiral GRIFFITHS. I think it will be made sometime during the month of December.

Mr. SPENCE. In any event, I guess the bottom line, the thing that we are talking about in all this is what will our building rate have to be to maintain our forces?

Admiral GRIFFITHS. Three and a half per year.

Mr. SPENCE. And that wouldn't change too much? You are talking about the SSN as it is right now? Even a cheaper submarine wouldn't increase that situation any, would it?

Admiral GRIFFITHS. Well, it all depends. Certainly if you used the same amount of dollars it wouldn't increase it very much. But if the indication was that the Navy had gotten the message that we were willing to go smaller and cheaper and therefore that we would receive a greater amount of money to build submarines, it could perhaps get us more submarines. That is the philosophy in moving toward greater numbers.

Mr. SPENCE. I know you have been talking about all these numbers and the 5-year shipbuilding plans and on down the road and all the rest. Do any of them even suggest that any administration is going to request three and a half submarines a year?

Admiral GRIFFITHS. I have not seen any indication that we are going to request three and a half per year.

Mr. SPENCE. I haven't even seen over one or two anywhere.

Admiral GRIFFITHS. I can see where, if there were a significant enhancement in the shipbuilding funds that were provided, where we could perhaps building up to three a year.

Mr. SPENCE. And what else is going to slip then? Do you have all the rest of the ships?

Admiral GRIFFITHS. This depends on whether you get 5 or 7 percent more, which is being discussed at the present time.

Mr. SPENCE. I think it is a fantasy to suggest that the administration will request that many. Do you agree with Admiral Gorshkov when he states that the importance of speed will grow in the future?

Admiral GRIFFITHS. I do.

Mr. SPENCE. That is all I have.

Mr. BENNETT. Mrs. Byron, do you have a question or are you only pointing out we are only getting one?

Mrs. BYRON. Yes, I was pointing out we are only getting one and we are talking about three and a half. We are a long way from meeting that.

Mr. BENNETT. I haven't documented it and I thought it unnecessary to do so, but most of the time when they have talked about more numerous cheap ships, they haven't come up with the more numerous part.

The cheap ship has been there, but the numerosity has been lacking.

Mr. Emery?

Mr. EMERY. Thank you, Mr. Chairman. What characteristics of the submarine enhances its maximum speed? If you were going to design a submarine, how do you design it to go a few more knots?

Admiral GRIFFITHS. I would like to ask my naval constructer to answer that one. I think he can do a better job on it than I can.

Admiral WEBBER. It might be useful in answering that question, Mr. Emery, to review the changes that we included in the design studies we have been working on in the last several months.

In the case of a submarine, the hull shape or the hull form is very important regarding its hydrodynamic resistance. There is an optimum [deleted] in which you have the proper blend of form resistance and surface resistance to give the most efficient hull form.

We have used that concept in the design studies, and thereby have achieved some improvement in speed. The hull [deleted] has also proven to be a very important factor. The design of the control surfaces and elimination of any unnecessary appendages are also important regarding the hydrodynamic performance. We have taken all of those steps in refining the designs we have been working on.

Obviously the more shaft horsepower you can pack within the hull, the faster you are going to go. We have drawn on modern technology to improve the efficiency [deleted] to improve the efficiency of the steam system. Another important factor has been work which is underway in the combat systems area [deleted] which permits an overall reduction in ship size. All of these items have been combined to improve the speed performance without degrading the combat capability of the submarine.

Mr. EMERY. So the [deleted] is a consequence of balance between the structural design necessary to withstand [deleted] depth versus the shape of the bow, for example, and the [deleted] hull to facilitate moving through the water. Is that essentially correct?

Admiral WEBBER. Yes, sir, that is essentially correct.

Mr. EMERY. Am I also correct in assuming that by designing a [deleted] hull the Soviets have been able to achieve a more favorable [deleted] balance; [deleted].

Admiral WEBBER. [Deleted.]

Mr. EMERY. What I am really getting at is it makes some sense to me, and I may be wrong in my assumption, that a longer submarine of narrower diameter will move through the water more efficiently or faster than shorter, blunter, wider submarine. Is that essentially correct?

Admiral WEBBER. No, sir. There is an optimum point [deleted] that turns out to have the minimum resistance for a given internal volume of a submarine. In the limit, [deleted]. This is inefficient. At the other limit.

[Deleted.]

Mr. EMERY. So balancing the surface friction along the leading edge versus the friction on the lateral edge——

Admiral WEBBER. That is right. It is the balance between form resistance and wetted surface resistance.

Mr. EMERY. It depends on the fluid medium?

Admiral WEBBER. Yes, sir.

Mr. EMERY. That brings to mind another point.

Airline manufacturers a few years ago realized if they created some kind of a bow in the front of the fuselage, and you can take a look at

a 747 and see what I mean, due to the fluid dynamics of the air they found you can actually enhance the speed characteristics and reduce drag by a natural flowback.

Have similar experiments been done with fluid dynamics of water with respect to submarines, and what have the results shown?

Admiral WEBBER. The results really are somewhat counter to that because of the fact that water is incompressible, whereas air, of course, is a compressible medium.

As a matter of fact, a more gradual increase in the volume of the shape, which permits maintenance of what we call a laminar boundary layer a lower resistance than a boundary layer, enhances the hydrodynamic performance. So, strictly from that point of view, you would do the reverse of what an airplane would want to do in order to maintain the laminar boundary layer as far aft on the submarine as possible.

Mr. EMERY. That depends primarily on the medium.

Admiral WEBBER. Yes, sir.

Mr. EMERY. I am all through.

Mr. BENNETT. Mr. Kriser?

Mr. KRISER. Yes. Thank you.

Admiral Griffiths, I think the committee might be interested in your views on redundancy of equipment and safety and the importance of it. Some of the alternative submarines that have been suggested have reduced redundancy and I wonder if you would comment on that with respect to the submarine safety program and also how much you would be willing to compromise on the alternatives study with respect to redundancy?

Admiral GRIFFITHS. I think that a submarine needs reliability probably more than anything else, particularly if you have a small number. This is because you are going to send it out to sea and it is going to stay out there for a long period of time on its own.

My experience has shown that during long independent operations machinery breaks down and in order to be able to stay out there and to be able to sustain yourself, you have to have reliability, and to have that you have to have back up, that is you have to have redundancy.

We have built a great deal of redundancy into our submarines. Have we built too much? I don't think we have. My opinion is we need the redundancy that we have in our submarines for safety and for reliability. One of the alternatives that a shipbuilder has suggested is a so-called base line submarine which has absolutely no redundancy built into it. It was designed that way on purpose, so that they could see what it costs both in speed and displacement and in dollars to add items to this base line submarine. Therefore, it was designed with one periscope, with no snorkel, with one radio mast, and with one of everything as far as equipments are concerned in the ship.

Really we wouldn't want to go to sea in that ship because it just would be inadequate to do the job. It would not have the reliability that we need nor the sustainability that we need. But I don't believe anybody would expect us to go to sea in that particular model. What we are going to do with that model is add some things back into it that we would need for minimum redundancy and take another look at it and see how it plays, how much we have to add to it.

We think we will probably have to add enough to it so it will look very much like the 2A an therefore be very similar to the 2A in the submarine alterntives study, which would not make it as effective as the 688.

Does that answer that question?

Mr. KRISER. Yes, thank you.

Mr. BENNETT. Any other questions?

Mr. Mollohan.

Mr. MOLLOHAN. I have been concerned about this ever since I found out about this study. As a submarine warfare officer, having spent your career in submarines, what is your reaction to us promoting here a ship which will be our weaponry you might say, in the advanced submarine warfare field for the late 1900's and the early 2000's which has an obvious inferiority in one of the primary fields of capability of a submarine when we speak of quietness and we speak of speed and these ships will obviously have inferiority in the field of speed capability.

It has been testified here by the Assistant Secretary that [deleted] we would have an inferiority in speed and what are the disadvantages of having a condition like that projected as being our role in the submarine warfare situation?

Admiral GRIFFITHS. I think the disadvantages are significant.

Mr. MOLLOHAN. Why do we go on and consider something like that? Why don't we try to project our research into the field of reaching at least comparability with the acknowledged, established capability of the Russians in the submarine area? They have a ship now, a submarine, that has a [deleted] capability and here we are projecting for the future a ship which may have [deleted] capability. It sort of amazes me that we would come out with this kind or that we would spend money on this kind of research.

Admiral GRIFFITHS. Once again, I think that we are looking at alternatives. We are trying to provide the maximum number of alternatives prior to making the decision as to which way we are going to go in the future. My personal reaction would be a great concern about going to a slower alternative because my operational experience has shown me that speed is important. Therefore, I would have a great aversion to do that. But I also understand the tremendous affordability problem that the Navy faces and that we need submarines in greater numbers and if the only way we can get submarines in numbers is to build less capable submarines, then I would be inclined to say let's look at this very carefully before we decide to build less capable submarines even if we could get the numbers. As was pointed out earlier by the chairman, if we get a cheaper submarine and don't get the numbers, I would certainly say that would be the wrong way to go.

Mr. MOLLOHAN. What kind of situation are you going to be in as a submarine officer if you are in command of a submarine that has a speed capability of [deleted] and your opponent has a speed capability of [deleted] and comparability in the area of quietness? What kind of a competitive situation are you going to be in?

Admiral GRIFFITHS. [Deleted.] That would be the only solution to that problem.

Mr. MOLLOHAN. The tremendous advances that the Soviets have made in the last several years, and certainly not just in the submarine field, suggest to us that they are not standing on their laurels today. They are continuing to progress and progress very, very rapidly.

As I said earlier, [deleted].

I can't, in good conscience, sit here and vote for a weapons system which I know to be inferior to what the possible enemy may have already and projecting my weapons system for the next generation, I can't sit here in good conscience and vote for it.

Admiral GRIFFITHS. I don't know that you will be asked to do that.

Mr. MOLLOHAN. I would hope not, but I consider this whole thing we have done here last year, this study, a wanton waste of money. I think the ultimate conclusion can't be anything except failure.

Admiral GRIFFITHS. I cannot personally view it as a wanton waste of money myself. I think it has been a very worthwhile effort.

Mr. MOLLOHAN. What good can come out of it? Can it be complete rejection of the idea once and for all?

Admiral GRIFFITHS. It could be.

Mr. MOLLOHAN. That would be an advantage, I think.

Admiral GRIFFITHS. We have stimulated a significant amount of submarine design effort that was not formerly ongoing.

I talked to Admiral Byron last Friday and he told me that he never had seen such enthusiasm over in the Naval Sea Systems Command among the ship designers because they have done more work on the submarine ship design in the last year, ship in bringing forth these alternative designs for us, than they have done in years. They are enthused and stimulated by it, so I think that is good and that is something that has come out of it that in itself made the whole thing worthwhile.

Mr. MOLLOHAN. In the design of these ships that we are talking about, in the SSN 688 modified or this new one we are talking about, have we exhausted all of the potentials which Admiral Webber spelled out in response to a question earlier as to what would make for speed, additional speed? Have we exhausted all of these elements?

Admiral GRIFFITHS. Admiral Webber, you can answer that.

Admiral WEBBER. Yes, sir. They are included in the studies that we are just now reporting out. These studies, I would emphasize, Mr. Mollohan, are really follow-on studies which were initiated as a result of the Submarine Alternatives Study, but are really another chapter that we are now into.

Mr. MOLLOHAN. Do we still stand with this, and this new submarine I am talking about, or the earlier one we talked about? Are we still holding [deleted].

Is that the maximum we can get out of it?

Admiral WEBBER. No, sir. As a matter of fact, in June, after the Submarine Alternatives Study had been evaluated in the Chief of Naval Operations Office, and the [deleted] submarine had been reported out by NAVSEA, the Chief of Naval Operations, Admiral Griffiths' office, directed us to proceed and study a reengineered 688 submarine with enhanced capabilities and enhanced performance over the fleet attack submarine.

Mr. MOLLOHAN. What do you anticipate the end result of that being insofar as speed is concerned?

Admiral WEBBER. We are anticipating [deleted] for that ship.

Mr. MOLLOHAN. We still have [deleted] from what I understand.

Admiral WEBBER. Yes, sir. We are looking at the advantages and the hydrodynamics improvements that we discussed earlier. We are also looking at the possible use [deleted].

Mr. MOLLOHAN. [Deleted.]

Admiral WEBBER. Yes, sir, this provides some short-term improvement in speed.

Mr. MOLLOHAN. Following up on what I think should be our legitimate goal in all of Congress and you too, we ought to be directing our attention and our interests towards accomplishing that. It is just unconscionable to me to send a submarine officer and a crew to sea [deleted]. It is just inconceivable to me that we would think about it.

Thank you, Mr. Chairman.

WRITTEN STATEMENT OF REAR ADM. J. H. WEBBER

Mr. Chairman, Members of the House Armed Services Seapower Subcommittee:

The Naval Sea Systems Command has the responsibility to perform conceptual design work for new attack submarines. I will review the current status of such work. In addition, I will briefly discuss our efforts to provide the most effective submarine designs possible to meet performance requirements and cost constraints of the Chief of Naval Operations.

The results of the Submarine Alternatives Study have been presented to this Committee. Based on these studies, the Chief of Naval Operations asked the Chief of Naval Material (Naval Sea Systems Command) to develop new attack submarine design concepts as follows:

1. 5,000 Ton Fleet Attack Submarine.
2. Reengineered SSN 688 Class Submarine.

5,000 TON FLEET ATTACK SUBMARINE

In December 1978, the Chief of Naval Operations requested that the Chief of Naval Material conduct a design study of a new attack submarine which would be limited in size to about 5,000 tons and cost significantly less than the present SSN 688 Class submarine. The objective of this study was to achieve performance characteristics which would be operationally acceptable. The Chief of Naval Operations specified only a few minimum requirements, giving the designer wide latitude in development of the design.

With these groundrules, a fresh look was given to a submarine design, employing our best knowledge of hydrodynamics improvements, engineering system developments, and advances in quieting, sonar, and weapons suites. An integrated design approach was used, in which performance and technical characteristics were considered and balanced against each other.

The Naval Sea Systems Command conceptual design study was completed in April 1979 and the results forwarded to the Chief of Naval Operations. The conceptual submarine was about 2,000 tons smaller than the SSN 688 Class attack submarine and was estimated to cost 25 to 30 percent less after startup expenses, but was 5 knots slower.

Starting in June 1979, Naval Sea Systems Command has continued to develop this design in further detail and has undertaken tradeoff studies to determine the impact on the design of adding certain military capabilities as directed by the Chief of Naval Operations. These include electronics surveillance capability, provision for future sonar sensors now under development, space margin for the combat system, and incorporation of externally mounted Cruise missiles.

RE-ENGINEERED SSN 688 CLASS SUBMARINE

The Chief of Naval Operations in May 1978 directed the Chief of Naval Material (Naval Sea Systems Command) to conduct a broad review of all areas related to submarine construction to identify potential cost savings which may

be realized without unacceptable penalty to Navy standards or sacrifice of performance or safety. Ideas for reducing costs have been solicited from both submarine shipbuilding and overhaul shipyards, vendors, laboratories, and government agencies. This review, which includes the SSN 688 Class, has identified a number of savings which are being applied to present construction and other savings that can be applied to future designs.

In June 1979, the Chief of Naval Operations requested that the hydrodynamics, propulsion plant, and combat system techniques used in development of the Fleet Attack Submarine concept be applied to a re-engineered SSN 688 Class submarine to determine those performance improvements achievable with near-term technology. This new re-engineered SSN 688 Class submarine would also include the cost reduciton features mentioned above. Significant progress has been achieved with these studies, and the technical results are now being finalized.

Results of both design studies outlined above will be forwarded to the Chief of Naval Operations at the end of this month. It is anticipated that the Chief of Naval Operations will select a preferred candidate attack submarine which will enter into preliminary design this fall. Contract design would start in late 1980, with detail design in 1981. Our present schodule will support award of the lead ship of a new design in 1983.

Mr. BENNETT. If there are no other questions, next Monday we will hear from Admiral Rickover on his thoughts concerning new submarine designs for the future and considering that Admiral Rickover is now 79 and has been appointed for a 2-year term, we realize what an extraordinary event that is, but I am told his father was 93 when he died at work so he has a lot of years to go.

We will meet then at 10 o'clock next Monday. Thank you very much.

[Whereupon, at 11:35 a.m., the subcommittee was adjourned, to reconvene at 10 a.m., Monday, October 29, 1979.]

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HOUSE OF REPRESENTATIVES,
COMMITTEE ON ARMED SERVICES,
SEAPOWER AND STRATEGIC AND
CRITICAL MATERIALS SUBCOMMITTEE,
Washington, D.C., Monday, October 29, 1979.

The subcommittee met, pursuant to notice, at 10 a.m., in room 2216, Rayburn House Office Building, Hon. Charles E. Bennett (chairman of the subcommittee) presiding.

Mr. BENNETT. Good morning. The subcommittee will come to order.

This morning it is our pleasure to have with us Admiral Rickover, the Director of the Naval Reactor Program.

Congratulations on your reappointment.

Today, we conclude our hearings on the Submarine Alternative Study on future submarine designs. The subcommittee is very pleased with the recent announcement by the Secretary of the Navy of your appointment to these 2 years that are coming up and we are very pleased with the wonderful service you have made to our country. It is great to be in the presence of an American hero.

Admiral Rickover, we have your prepared statement and you may proceed as you see fit.

STATEMENT OF ADM. H. G. RICKOVER, USN, DIRECTOR OF THE NAVAL NUCLEAR PROPULSION PROGRAM, ACCOMPANIED BY DAVID T. LEIGHTON, ASSISTANT TO THE DIRECTOR FOR SPECIAL PROJECTS AND JAMES W. VAUGHAN, DEPUTY DIRECTOR

Admiral RICKOVER. Thank you, Mr. Chairman.

I am particularly happy that Mr. Price is here. As you well know, he was a charter member of the Joint Committee on Atomic Energy, and through all of the years of his service as chairman, and in duties on this committee, he has invariably helped. So whatever good has been done in this program, I give credit to him and to the other members of the committee. Whatever bad has been done, of course, in accordance with the normal congressional way of looking at things, is the fault of the executive branch.

I am glad you agree with that statement, sir.

Thank you for this opportunity to state my views on the status of future direction of the attack submarine program in the United States.

If you will approve, sir, I will submit my full statement for the record and only read parts that directly affect this testimony. It would take too much time the other way. Is that satisfactory, Mr. Chairman.

Mr. BENNETT. It is.

[Admiral Rickover's prepared statement is included in appendix.]

INTRODUCTION

Admiral ROCKOVER. Thank you, sir.

While some of the views I expressed today may be contrary to those of my superiors, I claim no superior wisdom. As I have in the past, I will give you my personal and professional views based on the information available to me and leave it to you to make your own judgment.

I might interpolate here and say this. I doubt there is anyone in the U.S. Navy today that has had as much experience or studied as much about submarine warfare as I have. It has been a subject that I have been interested in since the 1930's. In fact, my first interest was demonstrated in 1936 when I translated for the Naval War College, a book on German submarine warfare in World War I written by Admiral Baeur, who had command of the German submarines during that war, and I have been very much interested in it since that time.

I made a point over all other matters, to study submarine warfare and I am thoroughly impressed with its importance. I do not believe that in the Navy there is a recognition of what submarines can do, and I hate to see another war come up before we learn that lesson.

Furthermore, submarines today are far more potent, perhaps 50 times as potent, than they were in World War I and World War II. That is not recognized because the Navy, like every other organization, has its own parochial interests and the people who get into authority naturally and inevitably follow the interests of their particular group. In my opinion, submarines have been downgraded for quite a few years in the Navy and I would look to this committee to redress that imbalance.

IMPORTANCE OF HEARINGS

The subject of these hearings—The Nuclear Powered Attack Submarine Program—is vitally important. Yet this program has rarely enjoyed widespread support within the Defense Department. From the *Nautilus* over 25 years ago through our latest nuclear attack submarines, the *Los Angeles* class, there has been intense opposition to building nuclear powered submarines and to exploiting their speed and endurance to the fullest. It has only been through the leadership of Congress, including this committee, that the United States has the nuclear powered attack submarine capability we now have. You deserve the thanks of our people for your foresight and tenacity.

Currently the United States has 74 nuclear powered attack submarines, of which 10 are the latest SSN *Los Angeles* class high speed submarine design. Twenty-three additional *Los Angeles* class submarines have been authorized by Congress through fiscal year 1979. For fiscal year 1980, the Department of Defense proposed a shipbuilding program with only one *Los Angeles* class submarine. Fortunately, the Congress, led by this committee, added a second *Los Angeles* class submarine to the fiscal year 1980 program. The present 5-year defense plan submitted to Congress limits the nuclear powered attack submarine building program to one a year. I will discuss this building rate later.

We are a maritime Nation with far flung interests to defend. This is not the case for the Soviet Union, which is a land power that does not have to depend upon sea lines of communication to conduct military operations or for vital supplies. The mission assigned to our Navy is a far more difficult task than the Soviet Navy mission of denying us free use of the seas. It is far easier for them to break a link in our chain than it is for us to forge and maintain those links.

Our overseas logistic supply lines today are more vulnerable than at any time in our history, and their vulnerability is increasing. Because of improvements in submarines, including nuclear power, we face an increased threat in submarine warfare. There is also an increased threat of air attack because of the greater range in missiles and their improved means of target detection.

I would like to interpolate here and give you another personal comment. I would like to see a force of about 10 nuclear powered submarines, particularly the *Los Angeles* class, turned loose in an exercise in the Atlantic Ocean and show what they can do regardless of any other naval forces. That would be an interesting exercise. I recommend that this committee recommend to the Navy that it perform such an exercise to show what submarines can do. We may learn a good deal from that. You may learn the actualities of the situation which frequently are hidden in reports.

Further, the higher fuel consumption of post-World War II military units means the United States and its allies must transport larger quantities of fuel. In World War II we relied on a larger number of small tankers. I think the size of the largest tankers then was about 25,000 tons. Today we rely on a smaller number of large tankers, 2–300,000 tons. Thus, each tanker lost today will have a greater impact on our supply. Also, it makes it easier to attack only a few of them. They are very large and if a submarine were ever to get within target range of the large tankers they would inevitably sink them.

As the Soviet submarine, air and surface capabilities increase, it becomes more difficult to defend the supply lines to our allies and to combat forces. In that connection, one of the major trade routes is around the Horn of South Africa. All a few submarines would have to do is lie there and they could sink all of the ships coming from the Persian oilfields.

As the Soviet marine, air, and surface capabilities increase it becomes more difficult to defend the supply lines to our allies and to combat forces. Few people fully realize how vulnerable we are to the threat posed by the Soviet fleet.

SOVIET NAVAL THREAT

Now, I will talk about the Soviet naval threat. Please bear with me while I summarize that threat, even though I may repeat some information you have received from other witnesses.

Today we are faced with a naval threat more serious than any since World War II. Although the Soviets are developing a broadly capable

Navy, their predominant emphasis is on submarines. The Soviets have exhibited far more insight to the value of high speed nuclear submarines in modern warfare than we have.

Twenty-three years ago, Admiral Gorshkov, the Commander in Chief of the Soviet Navy, had a navy which was a little more than a defense oriented extension of the Soviet Army. Under him the Soviet Navy was transformed. Since 1958 the Soviets have built at least 1,800 new ships and combatant craft in 137 different classes, a program of naval expansion that surpasses the efforts of any other naval power.

From a defensive fleet in World War II, it has evolved into a major blue-water navy that challenges the United States for control of the seas almost anywhere in the world.

More important, the Soviet momentum for superiority in all phases of naval warfare continues while U.S. naval plans are far from certain and fluctuate every year. Never in peacetime has there been anything comparable to the current growth of Russian naval power.

Over an extended period the Soviet Navy has increased in numbers of ships and in capability. For example, the nuclear submarines in the Soviet fleet have increased from 69 in 1969 to about 155 today, surpassing us in this area in 1970. During this period, the number of Soviet surface combatants, including aircraft carriers have increased from 220 to 273 while our major surface combatants and aircraft carriers have fallen from 301 to 178. While the Soviet fleet has continued to increase in size, ours has declined.

Mr. Chairman, I want it distinctly understood I am not advocating we build as many ships as they do. I don't want my statement to appear that I am advocating that. I am only trying to tell you what the situation is. I realize the fiscal limitations that there are in this country. The fact that our country is dedicated to an entirely different role than the Soviets means we must fully take into account the welfare of our people. Their leaders can concentrate on getting military forces to carry out their policies. We cannot do that, nor do I advocate that we match them on a one-to-one basis.

The 7 Trident and 23 *Los Angeles* class nuclear attack submarines authorized through fiscal year 1979 but not yet at sea are expected to be delivered by 1985—with an average delivery rate of about five a year. Since fiscal year 1977, however, the Defense Department has reduced the submarine shipbuilding budgets to a level of only one attack submarine and one Trident per year. If we continue to budget at this low rate, our deliveries will drop from five to one nuclear attack submarine and one Trident submarine per year after 1985. That is a short time away.

At the same time, increasing numbers of submarines will have to be retired from service due to age. For the past 10 years the Soviets have been delivering at the rate of 10 nuclear submarines a year. Thus, the nuclear submarine gap continues to widen rapidly.

SOVIET BALLISTIC MISSILE SUBMARINES

In the area of strategic submarines, the Soviets have 70 nuclear powered ballistic missile submarines, compared to our 41. They have 30 *Yankee* class submarines which are equivalent to our Polaris and

Poseidon submarines, but their *Yankee* class submarines are all newer than ours.

The Soviets also have at sea 32 ships of their more modern *Delta* class ballistic missile submarines, and more are under construction. These carry missiles with a 4,200-mile range. This means that from their operating areas in the Barents Sea and northern waters they can target the entire United States, Canada, and most of Mexico. In total, the Soviet have almost twice as many nuclear powered ballistic missile submarines as we, and they continue to build more. Our first Trident submarine will not be delivered until 1980. Even then the building rate for Trident submarines will only be about one a year.

SOVIET ATTACK AND CRUISE MISSILE SUBMARINES

In the area of attack and cruise missile submarines the Soviets have a total of 265 to our 81. Of their total, about 90 are nuclear powered, of which about 40 carry cruise missiles in separate launchers in addition to torpedoes.

The United States has only 74 nuclear powered attack submarines. The Soviets continue adding to and modernizing their cruise missile force. In contrast, the United States is just now introducing into the submarine fleet the Harpoon cruise missile which can be fired from torpedo tubes. The following table compares the submarine fleets.

COMPARISON OF UNITED STATES AND SOVIET SUBMARINES, OCTOBER 1979

Submarine type	Soviets [1]	United States
Attack:		
Nuclear	50	[2] 74
Nonnuclear	155	7
Cruise Missile:		
Nuclear	40	0
Nonnuclear	25	0
Ballistic Missile:		
Nuclear	[3] 70	41
Nonnuclear	17	0
Subtotal:		
Nuclear	160	115
Nonnuclear	197	
Grand total	357	122

[1] Numbers are approximate.
[2] Approximately 10 units thus far are equipped with the Harpoon cruise missile which can be launched from torpedo tubes.
[3] Ballistic missile submarines include 30 Yankee's, 32 Delta's and 8 older units. Not all are capable modern launcher platforms.

SOVIET CONSTRUCTION CAPABILITY

The Soviets have the largest and most modern submarine yards in the world having a nuclear submarine production capability of 20 ships a year, working on a one-shift-per-day basis. While not fully utilizing this vast building capacity, they have since 1968 completed almost 100 nuclear powered submarines. For many years they have been outbuilding us in nuclear powered submarines at an average rate of 3 to 1.

As late as 1966, the Russians had only two new construction yards for building nuclear submarines. Today they have four. You could

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be[illegible]y available

fit all U.S. nuclear submarine construction facilities into just one Soviet submarine facility. Yet, they continue to expand their submarine facilities.

The logical question one must ask is: Why are they increasing their submarine building capacity when they already have so large a capacity, a capacity greater than any other nation?

As you my recall, the Soviets were able to build 80 conventional submarines in just one post-World War II year. Since they already possessed facilities to construct 80 submarines in a single year, why have they spent their manpower and money to greatly expand this capacity?

The most we have ever been able to deliver to the fleet since World War II is 17 nuclear submarines in one year. Thirteen of these 17 were of the Polaris type which had the highest national priority and unlimited funding. During the peak years of our submarine building program we were constructing nuclear submarines in seven shipyards—five private and two public yards.

At present the maximum U.S. capacity to build nuclear submarines is about one-fourth that of the Soviets, and our capacity may be further reduced if the current low authorization rate causes one of our remaining two construction yards still building submarines to get out of the business. That statement is probably one of the most important parts of my testimony. Under no circumstances must we permit a situation to develop where you have to depend on one yard in the United States to build submarines. That is what we are rapidly heading for. In my opinion, if we left it up to the civilian management of the U.S. Navy that is what we would get.

LARGE SOVIET SUBMARINE DESIGN EFFORT

Of greater concern than total numbers is the emphasis the Soviets place on innovation in submarine design. In the past 10 years they have introduced more new submarine designs than have ever been put to sea during a comparable period in all of naval history. Since 1968 the Soviets have introduced at least nine new submarine designs or major modifications in design, besides converting older submarines to improve their capabilities. They have introduced significantly improved versions of their attack, cruise missile, and ballistic missile nuclear submarines. Also, they have a new deep running, very fast nuclear attack submarine. In contrast to these wide ranging developments, the United States has introduced only two new submarine designs during the last decade.

I feel very deeply about this, not that we should have so many new designs, not that we should have so many more submarines, but the fight I have had with the civilian bureaucracy in the Navy and Defense Department over all these years, to get anything done. It has been horrible. I believe the members of this committee know it. You would think that those people who are charged with the responsibility for our defense would at least listen to us frequently. They won't even do that. We are just a nuisance and I think you remember in recent years the difficulty we had of even getting heard in the Defense Department.

Yet what is the purpose of the Defense Department? What is it? Is it just to make a lot of jobs for civilians who have no experience? That appears to be the case. They are running around making speeches. They are doing all sorts of things, except, many of them, paying attention to their jobs. I think you can gather from my tone that I do not think too highly of many Defense Department officials.

The present Soviet submarine program enjoys strong support and virtually unlimited funds. They have a centrally controlled program that has continuity and direction over many years. They have built up a huge array of facilities, tried out many designed and learned from their mistakes. They continue new developments in parallel with producing their best available current models in a well structured, consistent way. They have trained a large number of technical people committed to submarine work who now have decades of experience.

Twenty or more years ago when they started out, it was obvious their efforts were not very methodical or very well directed technically. But you can take any organization, if they keep on working their way for a period of 20 years they are bound to become good. The Soviets have become good and we no longer have great technical superiority over them because we will not vote the effort and money for it. They do. They have made this the leading element of their military strength and they are doing it.

We don't want to do that, nor do I advocate giving submarines priority over everything else. But I do think we should recognize the importance of submarines in any potential war, and we should at least support them in a reasonable way.

Their experience is obviously in the improvements we see in the new ships they are building. They are exploring many areas of submarine research and development. We, on the other hand, have a fluctuating uncertain approach to our submarine efforts. Today we are struggling to keep even a modest technical and industrial base for submarine work. We also have uncoordinated submarine research and development programs that constantly change due to budget changes and transient management.

The Soviets have made their nuclear submarine program of highest national priority because they know it has the greatest potential for defeating the United States in any war that is not quickly decided by strategic nuclear weapons. The capabilities of modern nuclear submarines are awesome; no one has yet experience what they can do in an unrestricted war at sea. Soviet attack and cruise missile nuclear submarines would be able to devastate our ocean commerce unless we are prepared to counter them and carry the war to their own waters.

CUTBACK IN DEFENSE DEPARTMENT NUCLEAR ATTACK SUBMARINE PROGRAM

In the face of the Soviet effort, the Defense Department has cut back the submarine construction program. There are also indications within the Navy and Defense Departments that they want to start building submarines that are cheaper and less capable than our cur-

rent high speed *Los Angeles* class. Although some witnesses may tell you that no decision has been made, actions are clearly being taken indicating that the civilian hierarchy in the Navy and Defense Departments are planning on a cheaper, less capable submarine.

Thus, while the Soviets are increasing their submarine program and the capabilities and speed of their submarines, the United States is reducing the number and appears to be moving in the direction of reducing the capabilities and speed of our nuclear attack submarines.

I believe you had one civilian official up here to testify recently, and he appeared to deny this. Yet there was a report of a discussion he had with a Washington Post reporter which quotes him as saying we should have less capable submarines. I discussed that with him by telephone. He denied some of the statements. I suggested he write a letter to the editor of the Washington Post and deny that he had made these statements. So far, apparently he hasn't had the time to write such a letter.

You understand what I mean, Mr. Chairman?

Mr. BENNETT. I understand what you mean, but I must say I have had similar experiences with the press myself and sometimes they don't publish your letter. He may have written the letter and it wasn't published.

Admiral RICKOVER. It might be worthwhile for the committee to ask if he ever has written such a letter. I would appreciate it very much if you would do that.

Mr. BENNETT. All right.

Admiral RICKOVER. History is repeating itself. The situation today is not unlike that in the early days of *Nautilus* when Navy officials, unable to appreciate the significance of nuclear powered submarines, pressed for slower, less capable diesel submarines. One of the reasons for this is that we continue to have civilians in positions of power who have little understanding of the technical or operational aspects of naval ships. In the short time they are in their positions they inevitably have to deal with the budget and they end up trying to structure the Navy according to budgetary considerations with little real appreciation for what is needed to meet the threat. These officials often have no idea of what it will take to fight a war. Once they leave, a new group will come in and we will start the study process all over again.

I remember talking to Admiral Burke one time about this situation and he said we can't build so many submarines because we don't have the money.

I said, "Admiral, that is not your job. You should make your wants known to Congress. Let them make the decision. It isn't up to you to be integrating the effect of the budget on what you need. Your job is to tell Congress what you need and let them decide what you get." And I think that is a fair way to put it. It isn't up to the naval officers to be budget experts.

LOW BUILDING RATES

For the third consecutive year the Defense Department budget has recommended a procurement rate of one SSN per year. The 5-year defense plan submitted to Congress would continue this low building

rate through fiscal 1984. If this program remains unchanged, there will be serious degradation of our construction capability and it will be impossible to maintain the minimum force level of nuclear powered attack submarines currently considered necessary.

Mr. Chairman, in the next several paragraphs of my prepared statement, I have summarized the fight you and other Members of Congress took on 10 years ago to turn around the Department of Defense plan to stop building any nuclear submarines after fiscal 1970.

In July 1968, despite the objections of the Director of Defense, Research, and Engineering and the OSD systems analysts, the Secretary of Defense and the Deputy Secretary of Defense decided to proceed with the high speed submarine. Later that year OSD systems analysts got the Deputy Secretary of Defense to re-raise the issue as to whether we should continue to build the slower *Sturgeon*-class submarines in lieu of the faster but more costly *Los Angeles* class. This was thrashed out at length.

Finally, in December 1968 the Deputy Secretary of Defense decided that we should go forward with the *Los Angeles*-class submarines. The idea of canceling the nuclear attack submarine construction program after fiscal year 1970 was also dropped.

The most horrible part of this fight was that the Director of R. & D. for the Defense Department was against building more submarines. Here are our leaders, the people put in these jobs, the R. & D. people in the Navy and Defense Department whose job it is to have forward looking ideas. Apparently almost invariably they have eyes in the back of their heads.

I think you know this and I think it raises a serious question about why the supposed thinkers for our defense are acting this way. How do you know that they are not doing the same sort of things in other areas of our defense? A man doesn't change his colors. You know this story. I must candidly admit I don't know why this committee tolerates that sort of stuff. Ultimately we have to look to this committee and I think it is time that your committee took action about the irresponsible actions of some of these defense officials.

ACTION OF CONGRESS

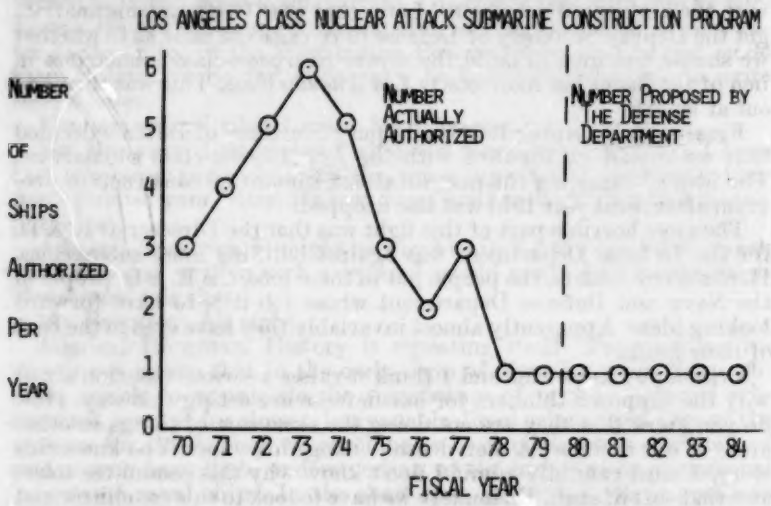
In the fiscal year 1970 and 1971 shipbuilding programs the Congress not only approved the *Los Angeles*-class submarines requested by the Defense Department but added an extra submarine each year. So here again, what we have is not due to the officials responsible for our defense but the Congress. The committees involved published many statements on the importance of having high speed in our attack submarines and have insisted that the *Los Angeles*-class proceed with high priority.

Without the initiative and persistence of Congress there would today be no *Los Angeles*-class submarines.

But, in the Defense Department, getting authorization to proceed with a program does not actually settle the issue. This is true no matter how many years the project has already been delayed while the pros and cons have been debated. In 1971 and at various other times questions repeatedly arose about stopping production of *Los Angeles*-class submarines and going back to building the *Sturgeon*-class submarines.

even though there would have been little cost savings and considerable loss of capability.

The current studies are but the latest of the controversies over what type and number of attack submarines should be built. The current rate of one attack submarine budgeted per year shows how difficult it is to get the attack submarine program taken seriously for very long within the Defense Department. The following chart shows the *Los Angeles*-class shipbuilding program declining from three to six per year during fiscal years 1970–77 to the present Defense Department plan of one ship per year.



UNITED STATES WILL NOT MAINTAIN MINIMUM ATTACK SUBMARINE LEVEL

In 1973, the Chief of Naval Operations determined that the Navy needed a minimum force level of 90 nuclear attack submarines to carry out the Navy's mission. This level was based on our attack submarines carrying out the traditional roles of attacking enemy submarines and surface ships, conducting offensive operations to close enemy ports, and patrolling barriers at sea or in ports to prevent passage of enemy ships. This level did not take into account the use of attack submarines in direct escort support of surface ship task groups. Nor did it reflect the additional potential use of the submarine launched cruise missile in a land attack role.

As the demand increases for high speed submarines in escort roles, and as cruise missiles are phased into the submarine force, our nuclear attack submarine force level will be further strained. Thus the level of 90 submarines is considered to be the very minimum the Navy needs to fulfill its responsibilities and will certainly not be sufficient if we regress to building less capable attack submarines.

Because of the higher procurement rate in past years, the number of operational nuclear attack submarines will continue to increase until about 1983 as the *Los Angeles*-class ships are delivered. But after

that, the number of nuclear attack submarines will decline as the retirement rate of older, obsolete ships exceeds the one-per-year building rate currently being proposed by the Defense Department. At that time, our attack submarine force level will fall below the minimum 90-ship level. As the bulk of our *Permit*- and *Sturgeon*-class ships reach retirement age, the drop will accelerate.

In 1968 the Congress had to step in and keep the Defense Department from stopping construction of any nuclear attack submarines. Even with the actions of Congress, we will by 1985 be at an approximately 2-to-1 disadvantage with the Soviets' high-speed nuclear attack submarines. Unless the Congress steps in again we will allow the Soviets to achieve an even greater advantage beyond 1985. I would genuinely fear for this country's future if this is allowed to occur.

SUBMARINE CONSTRUCTION BASE IN JEOPARDY

In the next three and a half pages of my prepared statement, I discuss the fact the presently planned submarine building rate places our submarine construction base in jeopardy and stress the importance of retaining at least two submarine building yards. I know that this is a matter of great concern to this committee.

BUILDING LESS CAPABLE ATTACK SUBMARINES

A major focus of these hearings is the increased attention being given to building cheaper and therefore less capable nuclear attack submarines. A number of studies and proposals are being made and they seem to have grown like Topsy. A key one, however, is a study directed by the Secretary of the Navy and called the Submarine Alternatives Study. This study was initiated as a result of a request in the Senate report on the fiscal year 1979 Defense authorization bill. This study has been approved by the Secretary of the Navy, and the Secretary of Defense has forwarded copies to Congress.

While this study concludes that the *Los Angeles*-type submarine is the most cost effective of all the options considered for realistic wartime conditions, the alternative designs in the study are being used by some as a basis to plan on building cheaper, slower, and less capable submarines.

ANALYSIS OF NUCLEAR ATTACK SUBMARINE DEVELOPMENT

I have previously received several requests for my comments on the Submarine Alternatives Study. Rather than just address the specific contents of the study, I prepared an analysis of nuclear attack submarines to put the attack submarine in perspective. I would like to include an unclassified version of this analysis today as part of my unclassified statement.

May I do that, sir?

Mr. BENNETT. Yes.

[The document referred to is included in the appendix.]

Admiral RICKOVER. Thank you, sir.

Since it is lengthy, I will not read it. I encourage the members of this committee to read the classified account which was previously provided to the committee so they might have the benefit of all the

available information. I believe my analysis addresses the key areas you are investigating in this hearing. There are, however, some specific considerations in this analysis I would like to emphasize for you.

SUBMARINE ALTERNATIVES STUDY

The task of preparing the Submarine Alternatives Study was assigned to the Assistant Secretary of the Navy for Research, Engineering, and Systems. Its objective was to "define and analyze alternative nuclear submarine forces to satisfy the Navy's near term objectives." The Secretary stated that "attention should be directed to options which offer the prospect of significantly reducing costs while retaining operational adequacy." That is, go out to the grocery store, get as good a loaf of bread at a cheaper cost. That is what this amounts to. That is an impossible task.

At the outset, the study was scheduled to be conducted by people almost entirely outside the Navy. While this would have insured that persons supposedly biased toward current submarine philosophy would not unduly influence the outcome, it would have excluded input from those responsible for submarine warfare. Apparently, the Secretary of the Navy understood the implication of this and wisely insisted on the Chief of Naval Operations involvement.

Based on how this study was first programed, I was concerned that the results would not be objective. As a result, I asked my people to cooperate to the fullest extent by providing whatever technical and cost information was requested, but not to become a member of the study group or get involved with the group's findings.

Incidentially, I understand that the Assistant Secretary of the Navy testified and indicated that somehow we wouldn't cooperate. He never asked for any direct cooperation. We supplied the information he wanted. He never asked for our opinion so we never gave him——

Mr. BENNETT. I don't remember any such testimony before our committee. I don't think anybody testified you did not cooperate.

Admiral RICKOVER. Said what?

Mr. BENNETT. I don't remember anybody testifying at any time in recent years that you have not cooperated.

Admiral RICKOVER. No. The point I am making is that we were not asked for our opinions. We were asked for information, which we duly gave, but we were never asked for our opinions. That is my point.

Mr. EMERY. I think the Admiral is correct. I remember distinctly asking the very question of the gentleman who appeared before us as to whether or not Admiral Rickover's office was contacted and if he had been asked to voice an opinion or if he had in fact prepared one, and the answer that I received was that his office has been asked for information and his office had cooperated but yet there had been no attempt on their part to ask the Admiral for his opinion.

Admiral RICKOVER. Thank you, sir.

Mr. BENNETT. I guess I just misunderstood what the Admiral said. I thought he said someone here had testified that you had refused to cooperate. There was no such testimony.

Admiral RICKOVER. No, sir. If I said that I didn't mean that. But you would think that in conducting a study of this type that the people who are mostly responsible and knowledgeable would have been asked for their opinions. That is the point I am making.

Mr. BENNETT. I understand.

BUILD CHEAPER SUBMARINES

Admiral RICKOVER. The executive summary of the Submarine Alternatives Study included the following statement in its plan of attack: "The basic thrust of this study is the establishment of an approach that would lead to the identification of lower cost submarines with acceptable military capabilities." That is a very worthy objective but it is very difficult to achieve.

As should be obvious, the Navy is perfectly capable of designing and building cheaper submarines, just as Detroit could design and build cheaper automobiles. The question is, will these cheaper versions serve the purpose for which they are intended?

If Detroit builds a cheap automobile and no one buys it, then the effort was a failure. However, automobiles are mass produced by the millions. If a company makes a mistake on a given model, it changes or drops that model and comes up with a new one next year.

With submarines we are dealing with a small number of inherently expensive items that must last for 20 or 30 years. If the Navy builds the wrong submarine, we are stuck with it for more than a quarter of a century. So the question boils down to, what do you want the submarine to do?

To make a submarine cheaper, all you need to do is tell the designer to remove certain capabilities. Each capability that is deleted or reduced, makes the submarine smaller, lighter, and thus cheaper. If you decide you do not want a certain speed capability or a certain depth capability, you can eliminate or reduce the requirements and the submarine will be cheaper. Where those pushing cheaper submarines inevitably fail, is when they try to prove that by reducing one or all of these capabilities, you end up with a cheaper submarine that will still do the job. In submarine design, as in other aspects of life, you never get something for nothing.

IMPORTANCE OF SPEED

Invariably, one of the first ideas for reducing the cost of submarines is to reduce speed. Therefore, current interest is to build submarines with a speed capability in the range of the slower *Sturgeon* class which the *Los Angeles* class was was designed to replace. Even today some people, who are supposed to be knowledgeable in this area, do not fully appreciate the substantial tactical advantage the *Los Angeles* class enjoys over slower submarines.

It does not take an expert to recognize the importance of speed in submarine warfare. With extra speed, a submarine captain has a far better chance of closing to within target range of every ship he detects so he can achieve the best position for attack. Speed enhances his ability to evade counterattacks, and to reattack the remaining units, even if they attempt to escape at high speed.

With speed, a submarine captain is better able to position himself advantageously to provide maximum tactical advantage with respect to his target. He can better avoid detection and, if detected, he has a better chance of evading torpedoes and other antisubmarine weapons.

The people that came up with this idea should have talked to some of those who were engaged in submarine operations in World War II and they would have gotten an earful about the importance of speed. The great advantage of nuclear power for submarines was exactly the issue of speed. At that time, diesel submarines could only make a maximum of 8 or 9 knots for 1 hour, submerged. That vastly limited us in submarine warfare. That is why the atomic submarine was so revolutionary. These people who are making these decisions are only thinking of saving money but they don't think of the military advantages involved.

By sprinting ahead and then slowing to listen, he can effectively search greater areas than a slower counterpart. He can respond more quickly to urgent requirements around the world. If he fires a weapon or otherwise divulges his presence, speed gives him a far better chance of clearing the area before the enemy can respond and deliver his weapons. Conversely, the faster he can close on a reported target, the better chance he has of finding it when he gets to the target area.

In the various missions which an attack submarine must perform in wartime, success or failure often hinges on tactical advantages provided by high speed capability. Moreover, even when a mission does not call for high speed operation, the high speed capability provides an important margin to recover from the inevitable human mistakes, errors in judgment, or incorrect choice of tactics which may have placed the ship in danger of enemy attack or caused the ship to lose its tactical advantage.

The higher speed capability of the *Los Angeles* class is essential to provide effective escort support to high speed U.S. surface task forces. The speed of these submarines enables them to search well forward of the task force and to provide early detection and warning of enemy submarines. This gives the task force an early advantage in prosecuting and attacking their targets.

After prosecuting an attack or after a task force course change, the high speed capability of the *Los Angeles*-class submarine enables them to regain position ahead of the task force. A slower submarine could not carry out this mission effectively without slowing down the entire task force. This, of course, would defeat the purpose of a fast surface ship task force.

This issue came up more than 10 years ago about the advantage of high speed. The original designation of the high speed submarine was a fast escort submarine. My concept at that time was to have these ships fast enough, and they are, to steam ahead of a surface ship task force.

However, the aviators were in charge and the surface ship people didn't want that because they wanted to retain surface ships as escorts, and they could not tolerate the idea of a submarine doing that job. So the designation of the submarine was changed from its original one of a fast escort submarine just to a high speed submarine. That was to mollify the surface ship people.

That gives you some concept of the parochialism which is evident in the Navy. I suppose it is true in the other military services also. I am not familiar with them. I have to assume that they are very forward looking, but your committee would know that better than I do.

The submarine alternative study concedes that the *Los Angeles* class speed is required for the direct support role but the study excludes the direct support role from its numerical analyses. The study also excludes from its analyses some other missions for which high speed is an essential factor. When these important attack submarine missions are taken into consideration, the superior cost effectiveness of the higher speed submarine would be much greater than shown by the cost effectiveness calculations in the study which excluded consideration of these missions.

What I have seen over many years in dealing with those people in the Defense Department is that they make up their minds as to what they want to do and then they get the systems analysts working to come up with their answer. That was Secretary McNamara's way of tackling defense problems. He figured out what he wanted, then he turned to the system analysts to prove what he wanted. They were frequently wrong, as this committee well knows.

IMPACT OF SPEED REDUCTION ON ATTACK SUBMARINES

It has been suggested that a relatively small reduction in the speed of a new attack submarine as compared to what we have with the *Los Angeles* class would not be important. Yet, in submarine warfare, speed is vitally important. As time doubles, the area in which a target can hide increases by a factor of 4. Thus, in 10 minutes a 25 knot target could be anywhere within 54 square miles, in 20 minutes he could be anywhere within 218 square miles; and so on.

If the same target were traveling 5 knots faster, in 20 minutes the area in which he could hide would be 314 square miles, roughly a 50 percent increase. Thus, whether one is the target or the attacker, every minute counts and every knot loss in speed means more time for the opponent to gain better position.

Reducing the speed of the *Los Angeles* class by, say 5 knots, would mean that:

The slower U.S. submarines would be unable to keep up with and attack most Soviet nuclear attack submarines.

The slower U.S. submarines would be unable to stay with and attack high-speed surface ships.

The slower U.S. submarines would be unable to escort U.S. surface ships in high-speed operations.

The slower U.S. submarines would require an extra day and a half to transit the Atlantic. In a day and a half a nuclear attack submarine could search an area roughly the size of New England or an area larger than either the States of Florida or New York.

It wasn't by accident I included the State of Florida in my comparisons. You can see how thoughtful I am of you, sir.

ACTUAL EXPERIENCE WITH "LOS ANGELES" CLASS

I recently received a letter from the commander of the submarine force in the Pacific which cites actual cases where the *Los Angeles*-

class submarines were superior to the less capable submarines in ways that could have been critical in a wartime situation. I would be happy to provide the committee with a copy of this letter. It is classified and will need to be reviewed for security in order to include it in the unclassified record. You will find, however, that the letter tells you what it means to have the *Los Angeles* submarine capabilities when you are at sea and not behind a desk. This comes from our leading operator in the Pacific. I request your permission to include that letter in the record.

Mr. BENNETT. Without objection.

Admiral RICKOVER. Thank you, sir.

[The following information was received for the record:]

DEPARTMENT OF THE NAVY,
COMMANDER SUBMARINE FORCE,
U.S. PACIFIC FLEET,
Pearl Harbor, Hawaii, September 28, 1979.

Adm. H. G. RICKOVER, USN,
Naval Sea Systems Command (08),
Washington, D.C.

DEAR ADMIRAL RICKOVER: Although I have been in my assignment as COMSUBPAC for only four months, I have already gained a high appreciation for the value of the 688 class SSN as compared with the 637 class. The following are some of my observations based on recent 688 class operations in the Pacific.

a. U.S.S. *Los Angeles* (SSN688) completed the first 688 class submarine deployment to the Western Pacific in August of this year. *U.S.S. Tunny* (SSN682), a 637 class submarine, was deployed to the Western Pacific during the same time frame and conducted operations similar to those of *Los Angeles*. Comparative data for those deployments is presented below. (*Tunny* miles steamed and EFPH expended normalized to *Los Angeles'* days underway are listed in parenthesis for comparison.)

	SSN 688	SSN 682
Days deployed	150	139
Days underway	101	90.5
Total miles steamed	35,000	31,688 (35,365)
EFPH expended	[Deleted]	
Average speed of advance (SOA) (knots) for underway days		
Maximum assigned SOA (knots)		
Maximum speed capability (knots)		

b. During one period U.S.S. *Los Angeles* conducted a 5,500 nautical mile transit [deleted]. The high transit speed was necessary to enable *Los Angeles* to participate in an important Seventh Fleet exercise. The route [deleted] requires several lengthy periods of slow speed shallow operation while transiting [deleted]. A 637 class SSN would have been unable to achieve the required [deleted] SOA for this transit. Even in an open ocean transit [deleted] a 637 class SSN would have to operate at flank speed [deleted] for the entire transit (except for brief periods at periscope depth for broadcast and housekeeping purposes). The 688 class, on the other hand, is capable of making this transit [deleted].

c. The 688 class SSN can conduct an effective sonar search of a far larger ocean area than a 637 class SSN equipped with the same sonar equipment. Based on the results of recent operations and exercises, the 688 class can search an area approximately 25 percent greater than the 637 in the same time period. The difference in search area is a direct result of the 688's greater speed capability.

d. During a recent exercise in which U.S.S. *Los Angeles* conducted simulated attacks on a carrier battle group, *Los Angeles* was able to maintain contact on the carrier and repeatedly reach attack positions [deleted] in spite of carrier

operations [deleted]. No other class of submarine could have even kept up with the carrier at such speeds.

e. Following an order to investigate a contact 50 nautical miles astern of a carrier she was escorting, U.S.S. *Los Angeles* reached the search area, conducted a 3-hour search, then broke off and regained the carrier's [deleted] position and intended movement (PIM) in 8 hours. This impromptu search would not have been possible for any other class of SSN.

f. In another recent exercise, U.S.S. *Los Angeles* was visually counterdetected while communicating with an exercise unit following a simulated attack. Her [deleted] speed capability enabled the ship to clear datum before any unit could respond or organise effective prosecution of the submarine contact. This demonstrates the defensive advantage provided by the 688 class speed capability.

g. During *Los Angeles'* Western Pacific deployment there were no material casualties in systems or equipment which limited the capability of the propulsion plant or support equipment. Although a routine 3-week IMA upkeep was assigned, no significant corrective maintenance of propulsion plant systems was necessary during the upkeep, and the ship was capable of responding to short notice tasking throughout the upkeep. The high degree of reliability of the 688 class propulsion plant is especially important for submarines. [Deleted.]

h. On two occasions in the past five weeks, I have assigned 688 class submarines in preference to other classes for short notice high priority tasking. My reason for selecting the 688 class over other ready SSNs was based on the 688's ability to reach the assigned area more rapidly and search a larger ocean area more quickly than any other class. When conducting surveillance-aided intercept, the 688's greater speed significantly reduces the time required to reach the target datum and allows assignment of a far larger search area than could be covered by any other class of submarine.

My experience to date with the 688 class SSN has proved that it can uniquely support operations demanding the ability to steam long distances at high speed, while still retaining significant search capability. The ability to reposition rapidly in a direct support role makes the 688 class SSN compatible with the high SOAs of a carrier battle group, and provides the operational commander with significant latitude in SSN employment where time, distance and effective sonar search rate are major considerations.

N. R. THUNMAN,
Rear Admiral, U.S. Navy.

Admiral RICKOVER. Soviet Admiral of the Fleet, Gorshkov has stated: "The ability to conduct swift actions will become the most important indication of a mastery of naval warfare." Certainly our operating people recognize the validity of this statement based on their experience with the *Los Angeles* class. Faced with a larger Soviet submarine fleet and the Soviet's commitment to high-speed submarines, we simply cannot afford to degrade the speed and effectiveness of our future nuclear attack submarines.

This certainly raises the issue of the officials who are over us. It reminds me of the pre-Revolutionary War period when the colonists complained about the host of officials King George placed over them. We have exactly that same phenomenon today. We get these people in there who have no experience but who want to demonstrate their authority. They don't take the time or trouble to find out the facts, but they want to show they can save money. Anyone can save money. That is the easiest thing in the world. You can save money right here in Congress by not appropriating money for anything, if that is your entire job. Apparently they are all out to make a record and show they can save money.

BUILDING LIMITED MISSION SUBMARINES

An argument that has been made is that we should stop building the *Los Angeles* class of nuclear attack submarines and build some less

capable submarines to perform less demanding missions. Of course, there are missions you can think of which do not require advanced capabilities. But with the large Soviet submarine force that is rapidly increasing its capabilities, and the long sea lanes of communication we have to defend around the world, we need submarines that can perform multiple missions, including the most difficult. In a war, how can we possibly know in advance which missions a given submarine will be called upon to perform?

European navies, with which we are sometimes compared, are by and large designed and built to fight along the coasts of Europe, in the Baltic, and in the Mediterranean. Because of our naval requirements, we have historically stressed building multipurpose ships. We have not banked on a static war in which limited mission submarines would be called upon to perform one task only for the war's duration.

In the course of a single deployment, a nuclear attack submarine may well be called upon to transit at high speed to reach its station, to conduct an area search in advance of a task group, or to provide ASW direct support during transit of that task group, and to probe deeply into the home waters of the Soviet fleet on offensive operations.

Unlike other weapons, the attack submarine fights its battles alone against an adversary which enters its patrol area, and with little external support. Under such circumstances limited mission submarines cannot win and thus are not suited to our needs.

If we were to have a submarine program of the scope of the Soviets, we might be able to build some limited mission submarines since we would have more than enough to take care of the primary objectives. But we do not have enough. Since we do not try to match the Soviets in numbers, we must build the most capable ships we can.

It is also important to realize that we already have, to some extent, a mix of less capable attack submarines now, and will continue into the future. These are the older submarines such as the seven diesel units and the early nuclear attack submarines. They were not built to be less capable. Each ship in its day was built as a fully capable unit based on the technology then available. When you have a continuous construction program time itself provides less capable submarines.

To build new submarines purposely with reduced capabilities would result ultimately in a force consisting preponderantly of limited mission ships, some new, some old. Adoption of such a strategy would make the Soviet's problem much easier.

I have also heard the argument that by building cheaper nuclear attack submarines the Defense Department will be able to build more of the cheaper units and thus help the numbers problem. In other words, we should trade ship capability for some future unknown construction program.

As this committee is well aware, the shipbuilding program changes all the time and it is as unpredictable a thing as anything in Government. The absence of a firm shipbuilding program is a major problem for this country, and I have no faith in any pledge by anyone that by building a cheaper nuclear attack submarine, more will be built. There is no past experience to suggest this will ever happen because no one can make such a commitment the way our Government deals with ship construction.

STATEMENT BY THE PRESIDENT

In my opinion, this entire issue could be settled in a relatively short period of time and without a lot of studies. If common sense were used, we would save everyone a lot of time. I think the President summarized the situation very well in a statement he made on March 30, 1979 in response to a press question as to whether the Navy should spend the available money for smaller, less expensive submarines rather than the current SSN-688 *Los Angeles* class and Trident submarines.

I quoted his statement on pages 31 and 32 of my prepared statement. The President concluded, "I do not think we will terminate those programs and change the design. I think they are very adequate, and I am very proud of what they will do in the future."

I find it hard to improve on the President's statement. I wish it would result in these studies being stopped so we can get on with our real work of building submarines. But these studies have a life of their own and they will go on and on. Ultimately the burden will fall on the Congress, as it always has.

Do not forget if an ordinary person came in and suggested building less capable submarines, we would give it absolutely no attention at all, Because it is so stupid. But when it comes in from our superiors, they are not supposed to be stupid because of their position. Ordinary citizens writing to us we can consider stupid, but it is against the law for us to think that any of our superiors are stupid, although sometimes privately I think they are. You know I do not normally say that publicly.

BUILD THE BEST IN PEACETIME

I have said many times before, in peacetime we should build the best and most capable weapons we can. In a real wartime situation we will not have time to build these complex ships at the rate we built ships in past wars. The judgment as to what type and how many we should build in peacetime is a question involving many elements; not the least being how much money the administration and Congress is willing to provide in competition with other national programs. But to reduce the capability of our future submarines while the Soviets are increasing theirs would be a grievous error.

COSTS OF "LOS ANGELES"-CLASS SUBMARINES

There has been much discussion about the increasing costs of *Los Angeles*-class submarines. As mentioned by the President, most of the increased costs have been due to the effects of inflation. In fact, when the increases associated with inflation are excluded, the end costs for the 33 *Los Angeles*-class submarines currently authorized through fiscal year 1979 are expected to be only about 6 percent greater than the amounts originally approved by Congress. It has not been a program with runaway costs beyond the general inflation every program has suffered.

WE CANNOT PREDICT THE FUTURE

Another factor which I do not believe is given serious enough attention is a realization of just what the threat will be in say 10, 20, or 30

years. Remember, a new submarine designed today will take at least 8 years before it goes to sea and will have to last well into the 21st century. No one knows what the enemy will have in 20 or 30 years. How can you even guess? How can you guess what missions will be demanded of our attack submarines? We have not fought a war at sea since 1945 and, if and when we do, a responsible official must assume that there will be many changes in strategies and tactics of naval warfare. We have never faced an enemy in war using nuclear submarines, nor have we ever used our nuclear submarines in a real war situation.

How can anyone regardless of how smart he may be, come up with calculations that prove, in a theoretical and mathematical sense, just what our submarines should be capable of? Yet this is what is going on. You all know studies can be used to show whatever you want. As I have discussed in my prepared statement, assumptions by the Defense Department that the United States could achieve a ludicrous 25-to-1 kill ratio were used a decade ago to show that we did not need to build any nuclear attack submarines. I believe all Members remember this, when the Defense Department said that each one of our submarines could sink 25 Russian submarines—and that was used 10 years ago to show that we did not need to build any nuclear attack submarines. At about the same time the systems analysts also suggested that we consider sinking 10 of our *Polaris* submarines to save money. Who would believe this? Yet the record shows that is what they did. Just think where we would be today if Congress had accepted their proposals.

I can assure you, Mr. Chairman, that the caliber of the system analyst has not improved any at all during that period.

CHEAP SUBMARINES WILL BE LESS EFFICIENT

If the Congress and the administration want the Navy to build cheaper submarines, all they have to say is "do it." But no one should be fooled into believing that they will be as effective as the *Los Angeles* class nor should the Navy be forced to say that is what they want instead of the *Los Angeles* class. If you give the Navy the option of having no submarines or some less costly, less effective submarines they will obviously choose the latter.

That reminds me of one time I testified when Carl Vinson was chairman of the committee. The question of aircraft carriers came up, and at that session there was a senior aviator who was talking for the Navy, and I was there. Mr. Vinson asked what would the Navy like to have, and Mr. Vinson was willing to authorize a nuclear aircraft carrier. That officer stood up for a conventional carrier. That disgusted Mr. Vinson very much, but this is the attitude you have. It raises a question, what is the capacity of some of our senior naval officers, how much vision do they have, how much chance are they willing to take in fighting with Congress? It raises a lot of issues about what sort of people you have in the senior positions in the Navy Department? I repeat, I know nothing about the other military services, but I assume that they have very wise leaders. I do not know anything about that. That is why I assume that.

But that does not mean the submarine operators will consider the slower submarines as adequate to carry out the mission they may face in a future war.

RECOMMENDATIONS

I would like to close by giving some specific recommendations drawing on what I have said already.

I would continue building the *Los Angeles* class. Today, it represents the best we know how to build. In addition, I would work hard on improving the design of the *Los Angeles* class. Such a reengineered ship might come out smaller, but then again, it might not. Remember, the *Los Angeles* was designed over 10 years ago and since that time we have learned more about its operation. These lessons will need to be incorporated into later designs. We should also work hard on research and development in all areas of the ship to improve further the capabilities of the *Los Angeles* design. To go to ships based on the *Sturgeon* class with reduced speed capability would be a step backward.

We need to develop a firm nuclear attack submarine building program in order to maintain adequate force levels for our most capable ships. A firm program is also needed to insure adequate shipbuilding and industrial capability is maintained at the lowest cost. A program of one *Los Angeles*-class submarine per year is simply not adequate for this purpose. I agree with the action initiated by this subcommittee to add an additional *Los Angeles*-class submarine to the fiscal year 1980 budget. This should help keep more than one shipbuilder in business. In the future we should build at least three or four a year in order to maintain an adequate force level, while retiring our older submarines.

Lastly, the Congress should look thoroughly into the adequacy of the research and development effort being devoted to the design of submarines. This research and development effort suffers not only from lack of adequate funding in some areas but also from lack of firm planning. One benefit if this were done would be to reduce the manpower being wasted on studies and use it instead to help our ships cope with Soviet developments.

That terminates my summary of my prepared statement, Mr. Chairman.

SUMMARY OF TESTIMONY ON ATTACK SUBMARINES

Mr. BENNETT. Thank you very much, Admiral.

I may not be accurate, but I think I will be accurate in making a few remarks now about what the testimony so far has been.

In the first place, these cheaper submarines were requested by the Senate to offset financial fiscal problems and try to get more ships of various types in the Navy. The House having insisted on building good ships, efficient ships, cost-effective ships—the effort was made by the Senate to see if some cheaper ships could be put in to save money because of the need for more numerous ships in the Navy.

Throughout the testimony so far there has been an assumption which you underline in your statement that 90 *Los Angeles* submarines are needed for the functions of the Navy. The testimony that came in was not really for the thrust of building cheaper submarines, but more to fulfill the obligation of making the study, to see what a cheaper submarine could do.

The testimony was that smaller ships, smaller submarines, I should say, could be built, but they would be built at a rate of about four.

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instead of three for the more expensive, more efficient type of *Los Angeles* submarine. They could not do some very important functions that the *Los Angeles* submarine could do.

Now, that is about the thrust of the testimony we have had so far. If any member wants to make amendments to that, that would be fine. But it does put in perspective what you said. We are nearing the end of our hearing.

Admiral RICKOVER. May I comment on the last part of your statement.

Mr. BENNETT. Yes, certainly.

Admiral RICKOVER. That issue arises at the same time that our potential enemies are increasing the speed of their submarines. That is one point I must make.

FIVE-YEAR PROGRAM INADEQUATE FOR FORCE LEVEL

Mr. BENNETT. I understand that. I understand the arguments on the other side. I am just saying what the testimony has so far been.

Now, the testimony since it showed four to three concerned the committee because we are looking at specific suggestions in a 5-year program. The 5-year program was for one 688 every year, which will never bring us to the 90 objective—1 year we will have met the 90 objective—but will not ultimately bring us a 90-submarine fleet.

Admiral RICKOVER. May I interrupt again. There is a far more important point than that. We may never get up to that point permanently, but many of our submarines are becoming obsolete.

So, the building rate that has been recommended will probably never, if we keep adequate submarines in service, get us up to 90 anyway.

Mr. BENNETT. Well, that is what I intended to say. I intended to say the 5-year program which has been submitted to Congress—and these are not my views, this is the testimony, I am just trying to analyze the testimony to date in this hearing—I don't think I am in error—the testimony was that the rate suggested for the outyears is not sufficient to reach the objective of 90 *Los Angeles*-class submarines. That is the one that has been made public.

Now, I talked to some people who did not testify and told them that the submarine that was brought into this committee was a submarine which wasn't very much cheaper, four to three. It lacked certain very essential abilities, and couldn't do some things at all.

That concerned me. I said, what can you give me as a reassurance that the outyears will be sufficient so we will get the 90 that we need with regard to the *Los Angeles*, and get these cheaper ships in addition, which I think was the thrust of what the testimony was.

I don't believe the testimony so far in this committee has been that they were going to substitute for the *Los Angeles* class these cheaper submarines, but rather build the 90 fleet and add to it.

Admiral RICKOVER. Mr. Chairman, I think you may be mistaken on that point.

Mr. BENNETT. If you don't mind, I didn't interrupt you, Admiral. I would appreciate not being interrupted.

So I asked them about this and they said in fact the plan was to stop building *Los Angeles* submarines and to build the cheaper type submarines because then we could get a 90 fleet.

I said it is not the same 90 fleet you said was necessary; to wit, the high performance type submarines. I also found out that apparently the plan is to revise the 5-year program from 1981 to 1985 is apparently to give us in that 5-year period three 688's and two of these cheaper submarines.

For some reason they call them the fast attack submarine. Of course, they are slower than the ones we have got I guess that is a euphemism to make them more attractive.

I am not doing any editorial comment in what I am saying. I am just trying to lay the background of what the testimony has been so far before this committee.

Now, I will question in the few remaining minutes I have left, if I have any. We don't count minutes very carefully here anyway. I just wanted to analyze this of what the hearing has come down to.

Is it your opinion that we do need 90 *Los Angeles*-type submarines to do the functions that the Navy must do in the outgoing years?

Admiral RICKOVER. Mr. Chairman, that is not a decision that I make. The number of submarines we have is decided by the Chief of Naval Operations. I do not make that decision. So for that reason I would like to stay out of that.

Mr. BENNETT. I understand. I will let you stay out of it if you want to stay out of it.

Admiral RICKOVER. Yes, sir.

ATTACK SUBMARINE PROGRAM JEOPARDIZES CONSTRUCTION BASE

Mr. BENNETT. Either one of these programs, either one of these 5-year programs comes up with only five submarines in the 5 years. You can testify that that is insufficient to keep the base going, the construction base going to have an adequate submarine fleet.

Admiral RICKOVER. That is correct.

Mr. BENNETT. I believe I stated everything I want to state. You made a very fine presentation. I didn't mean to cut you off a minute ago, but I didn't think you understood what I was trying to do.

All I was trying to do was not to editorialize but to summarize what has so far been before this committee.

Admiral RICKOVER. May I make another observation?

Mr. BENNETT. Yes.

ELECTRIC BOAT CO. EFFORTS ON SLOWER SUBMARINE

Admiral RICKOVER. The Electric Boat Co. has come in with a recommendation that we could build slower, cheaper submarines. The Electric Boat Co. has certain so-called submarine experts working for them.

When they were in the Navy as submarine people, these experts always asked for submarines with greater capability. When they start working for Electric Boat, all of a sudden they change and start in advocating inferior submarines.

In fact, the Electric Boat Co. has been lobbying in Washington for the slower submarine. I think the committee knows this. It indicates, "whose bread I eat is whose song I sing."

The fact that these were experienced naval officers does not change that. They all do that. I wanted to make that observation.

Mr. BENNETT. Thank you. I am not going to take anymore of your time now. We have the chairman of our full committee here, Mr. Price, who has done so much for our national defense, particularly in this field.

Do you have any comments or questions?

PREVIOUS CONGRESSIONAL CONCLUSION STILL CORRECT

The CHAIRMAN. Thank you, Mr. Chairman.

Admiral Rickover, I just happen to have in front of me a copy of a hearing, June 21 and July 25, 1968, on nuclear submarines of advanced design. The principal witness at that time was Admiral Rickover.

One paragraph says, "It is now clear to the committee that our Department of Defense has grossly underestimated the rate at which the Soviets are improving their nuclear submarines."

[Committee Note: Chairman Price was reading from the Joint Committee on Atomic Energy foreword to a joint committee print of hearings on June 21, 1968, on "Nuclear Submarines of Advanced Design."]

The CHAIRMAN. Now, that was 11 years ago. Do you have any comment on that situation, as of today?

Admiral RICKOVER. I made that statement before that year. That is how I would answer the question, sir. It was true even earlier. That is a correct quote, Mr. Price.

The CHAIRMAN. The subcommittee was repeating the Department of Defense statement at the time.

Admiral RICKOVER. I hate to catch you as chairman of the committee. You are supposed to be the smartest guy on the committee. [Laughter.]

Mr. BENNETT. I am the Henry Clay of this situation. I will say to you by way of compromise that you are both right. You said what you did earlier, but Mr. Price referred to a later statement.

Admiral RICKOVER. Mr. Price is absolutely correct. But even that statement——

The CHAIRMAN. Let me read the second sentence of that statement. "The committee is concerned that the Department of Defense does not apparently fully appreciate the significance of the rapid strides being made by the Soviets in this field."

Admiral RICKOVER. That is right, and they still don't, sir.

The CHAIRMAN. Thank you.

Mr. BENNETT. Mr. Spence?

IMPROVEMENT IN SPEED AND DEPTH

Mr. SPENCE. Thank you, Mr. Chairman.

Admiral, in view of the advances the Russians are making in the field of submarine warfare recently, the intelligence reports refer to the *Alfa* type class submarine, which can go faster and deeper.

Can we do anything to improve our submarines in that respect, from the standpoint of going deeper and faster?

Admiral RICKOVER. Yes, sir, we can. I don't know whether I should get into a discussion of that in an open session. I would rather that you ask me the question and I will supply it to the committee. Is that satisfactory?

Mr. SPENCE. We will get to it later on in executive session. But you can say that we can do more in that direction?

Admiral RICKOVER. Oh, yes.

Mr. BENNETT. If you don't mind my interrupting, we might lose some members here. I think it might be appropriate that you make the motion.

Mr. SPENCE. Mr. Chairman, for reasons for national security, I move we go into executive session, at the discretion of the Chair, for this day and 1 additional day.

Mr. HALE. Mr. Bennett?

Mr. BENNETT. Aye.

Mr. HALE. Mr. Price?

Mr. PRICE. Aye.

Mr. HALE. Mr. Spence?

Mr. SPENCE. Aye.

Mr. HALE. Mr. Mollohan?

Mr. MOLLOHAN. Aye.

Mr. HALE. Mr. Trible?

Mr. TRIBLE. Aye.

Mr. HALE. Mr. Fazio?

Mr. FAZIO. Aye.

Mr. HALE. Mrs. Byron?

Mrs. BYRON. Aye.

Mr. BENNETT. All right. Now you may continue.

Mr. SPENCE. The point I was trying to make is we have been receiving testimony that we should be building less capable and slower submarines, and our adversaries, as you pointed out, are building more expensive and faster submarines.

ADMIRAL RICKOVER'S INPUT TO STUDIES

The point I would like to make is that we should be going more in that direction, too, rather than the opposite direction, where we have been in that connection, I want to make one point clear again because we have gotten all around it today.

When the submarine study was being conducted recently, did anyone ever ask you for your views or your opinion?

Admiral RICKOVER. No, sir.

Mr. SPENCE. They might have asked some of your people, and you gave them information, but you were not directly asked by anyone?

Admiral RICKOVER. They asked for technical information. We gave them the technical information they asked for. We did not volunteer any other information because we were not asked. They presumably had the experts in the United States making the study.

Furthermore, they may have feared that we would say something contrary to their preconceived conclusions.

ATTACK SUBMARINE CONSTRUCTION CAPABILITY

Mr. SPENCE. Admiral, you probably testified about this earlier, but how many submarines do our submarine production yards—how many can they presently build right now? What is the capacity?

Admiral RICKOVER. We can build about five a year right now, if we had to.

Mr. SPENCE. And we have two yards?

Admiral RICKOVER. Two commercial yards. Of course, if there were a large shipbuilding program we could get Navy yards back into the business. But you should understand one thing, sir. During World War II we were building simple ships, and we could get large numbers of yards that could produce ships rapidly.

You cannot do that with a nuclear submarine. Under any circumstances they will take a minimum of 5 years to build a ship. Therefore, unless a war, would last for quite a few years, there would be no point to it.

I doubt very much that the kind of wars we would fight today with nuclear weapons would last that length of time. Therefore, as far as submarines are concerned and other large naval ships, we must be prepared to fight the war with what we have, realizing we will not get additional ships. The war will be fast and furious.

SOVIET SUBMARINE CONSTRUCTION CAPABILITY

Mr. SPENCE. The capability of the Russian yards is to produce how many a year?

Admiral RICKOVER. About 20, on a one-shift basis.

Mr. SPENCE. And your fear is not only that we need to build more submarines to keep up, but that we will lose our capacity to build submarines if we don't build more.

Admiral RICKOVER. That is correct, sir. However, as I stated before, the number of submarines we have depends on what the Navy Department advises Congress, and then finally and ultimately on what this committee thinks.

Whatever this committee decides will no doubt go through Congress. It is really up to you. If you ask me, I would say we certainly ought to have more right now. I don't think we need to get into the exact number. That is immaterial. For a given number of years we know we should build more.

Now, if we have a disarmament conference and the decision is made to reduce them, that would be fine, and I would certainly support that. I would support a disarmament conference that wipes out all submarines.

Mr. SPENCE. That is the point I was trying to make on the SALT talks. The people that want to disarm, that is one thing, but if you want to do something to lock us into an inferior position, that is something else.

Admiral RICKOVER. I would rather devote my energy on civilian atomic power, if I could. I think it is a horrible waste of effort, time and money to build these ships—unless we absolutely have to.

Mr. SPENCE. Mr. Chairman, that is all I have right now.

Mr. BENNETT. Mr. Fazio?

Mr. FAZIO. Thank you, Mr. Chairman.

I am one of the new members of the committee. I have the propensity to ask stupid questions, sometimes even to take stupid positions, like the people over in the Defense Department who occasionally disagree with you.

Admiral RICKOVER. It takes stupid people to answer stupid questions. I don't think your question is stupid, or I could not answer it.

Mr. FAZIO. I really have not asked it yet.

Admiral RICKOVER. Well, I was just making that as a point.

Mr. FAZIO. But I have a number I am sure would fall in that category. I guess what I would like to say initially, which really is not a question, is this has been the first exchange you and Secretary Mann have had since I have been on this committee.

Admiral RICKOVER. I have never met Dr. Mann.

IMPORTANCE OF EXCHANGE OF VIEWS

Mr. FAZIO. Even though you have not met, we have had an exchange of views, which I think is a healthy thing. His views really were rebutted more by the members of the committee who have traditionally I think agreed with your premises than even your rebuttal today, which in a sense directly met and, I think, fairly effectively criticized the points he was making.

Admiral RICKOVER. In a gentlemanly way, though.

Mr. FAZIO. Sure. I think that is a very healthy thing. I would like to thank the chairman for giving us the opportunity to have that exchange because I think in this Congress today, even more than perhaps in this committee, we need to have constantly reevaluated views on these issues.

We have to kind of retest our theories to make sure they are still valid.

Admiral RICKOVER. Do you really have time in Congress, as busy as you are, to listen to uninformed opinion?

Mr. FAZIO. Well, we have to anyway, whether we have time or not.

Admiral RICKOVER. You don't have to. You are the boss here.

Mr. FAZIO. Well, it seems to me a subcommittee like the Seapower Subcommittee, we only have so much time. One of the most important things we can get into is the future of our submarine program. An uninformed opinion, when held by people who are in authority, is important——

Admiral RICKOVER. Then the question is why are they in authority?

Mr. FAZIO. Well, that is a much deeper question. I would like to duck that one.

Admiral RICKOVER. You duck the embarrassing questions.

Mr. FAZIO. What I am trying to say, Mr. Chairman, is I think this has been a healthy thing. I am coming out of it with a good deal more general agreement than perhaps I would have anticipated with your theory about the *Los Angeles*-class submarine and the future that you would like to see for it, or, pardon me, an enhanced version of it.

APPROACH TO INCREASED CONSTRUCTION

But I think I would just like to ask you, kind of basically, how do we get there from here? How do we get to the point of having the number produced? You would like to see us go up to six per year

probably to keep that capability, and to make some gain in terms of our lower ratio with the Soviet Union.

How are we going to get there?

Admiral RICKOVER. By authorizing them. Don't pay any attention to the Navy because the Navy people will have to clear everything with their civilian superiors. Nothing gets done that is not cleared with them.

If this committee—and this committee is very powerful, from the standpoint that it is nearly always listened to in the House, certainly—and I think if you authorize six, we could build six.

That means money. That means the Appropriation Committee, also. What if you authorize two more? I think you could get that, too. That is up to you. I think I have made a case for more. I believe that the members of this committee, who are more expert in this field than any other committee, have always been listened to.

That is all you need do, is authorize them and get them appropriated for. We can build them. We have the facilities, as Mr. Trible knows. His yard can build submarines, but soon it will appear we will only have one building yard.

Mr. FAZIO. Well, I join with Mr. Trible in his successful effort, maybe more successful than he might even have assumed when he began his project, to get a second attack submarine authorized this year. I think that is a step in the right direction.

But I know how fortuitous that was. I have to be somewhat skeptical about the ability of the Congress to see much of an expanded submarine construction program, even with the 3-percent increase that probably is going to occur.

Admiral RICKOVER. Mr. Fazio, I don't take that attitude at all. I do the best I can. In the first place, I know that I am talking to a committee that is very experienced in this whole game. I have to convince them. Now it is up to the members of your committee.

As I said previously, I have found out this committee has a very fine reputation in Congress for pursuing proper causes. I think that is all you can do. You do the best you can. I am doing the best I can. You do the best you can. Maybe with both our efforts, and a little prayer, we may make out.

SHIPBUILDING CLAIMS

Mr. FAZIO. I think there are a couple of specific questions I would like to ask, and I will let Mrs. Byron go ahead with some others. This year the Secretary of the Navy settled the Electric Boat shipbuilding claims.

In the process, the committee was assured—and I have some correspondence I would like to insert in the record between the Secretary of the Navy and the chairman—we were assured that the Navy was taking steps to avoid similar problems in the future, to insure that the contracts are administered on a pay-as-you-go basis.

I am wondering if you could tell us what the current status of those contracts is right now.

Admiral RICKOVER. That has not been definitely settled. There is still a question in my mind that the Navy will enforce that.

I think that is a very fine question that you ask because the Secretary of the Navy has promised to the committee that all the costs

would be settled on a going basis. My opinion is that has not yet been done. That is a good question that you ask. I hope that you follow it to a proper conclusion and get a categorical statement to that effect You may get statements, but I doubt that you will get a categorical statement.

COST OF SUBMARINE PROGRAMS

Mr. FAZIO. The reason that prompts me to ask it is that I sense some of the problems we have in terms of getting support for the submarine program tends to emanate from a feeling that the Trident or some of the *Los Angeles* class efforts are constantly being underestimated, the cost overruns lose, I think, support for us, and the confidence that we hope to build in other members is sometimes eroded by these things.

Admiral RICKOVER. I mentioned in my testimony that the increased costs over and above inflation is about 6 percent, which is not a large sum. I would say this. The *Los Angeles* class is a fixed class. There should be no reason for any major changes.

That is true of the Trident, also. There will be some minor ones, but in my opinion the nuclear shipbuilding program today is such that you should not anticipate major changes in ships under construction. I don't know any reason for it.

We are requiring that any increases in cost be kept current. We are trying to avoid any claim situations. Whether that will work out, I cannot assure you. They have a large number of lawyers in Electric Boat.

Are you a lawyer, sir?

Mr. FAZIO. No, I am not.

Admiral RICKOVER. Good.

Mr. FAZIO. It politically has never done me any harm.

Admiral RICKOVER. They have a large number of lawyers constantly developing new legal theories for claims. That is going to go on until we behead a few lawyers and show that we really mean business.

I am sure there are no practicing lawyers in this room right now. There is nothing you can do in the United States today that legal theories cannot be invoked to get around them. I don't know of anything.

Mr. BENNETT. Without objection, the correspondence that Mr. Fazio asked be put in the record will be put in the record.

[The following information was received for the record:]

THE SECRETARY OF THE NAVY,
Washington, D.C., November 22, 1978.

Hon. MELVIN PRICE,
Chairman, Committee on Armed Services,
U.S. House of Representatives,
Washington, D.C.

DEAR MR. CHAIRMAN: Thank you for your letter of 8 November 1978. Let me state at the outset that I stand fully behind the assurances recited in your letter which were provided to your Committee in the hearings concerning the recent claims settlements. The Navy is committed to insure to the maximum extent possible that the shipbuilding claims problems of the past decade will not be repeated. These Public Law 85-804 settlements were truly an extraordinary solution to an extraordinarily complex problem.

As indicated in the Navy's testimony before the Committee, one of the single most effective ways to avoid future claims is to establish a businesslike relationship wherein the shipbuilder focuses attention on the construction of ships and the

Navy properly exercises its management responsibilities in administering shipbuilding contracts. I recently obtained a status report from Electric Boat on its progress in SSN 688 and Trident construction. They are currently achieving and, in certain significant respects, improving on milestones on these construction programs. Progress on the LHA and DD–963 programs is proceeding on or in early signs are encouraging, progress will conttinue to be monitored closely at early signs are encouraging, progress will continue to be monitored closely at Electric Boat and Ingalls, as well as at other major building yards.

The Navy is actively pursuing a broad program to improve ship acquisition performance and minimize the potential for future claims. The Naval Ship Procurement Process Study, issued in July 1978, is a centerpiece of this program. This study is focused on the very concerns you raise in your letter. The Chief of Naval Operations has joined me in a full commitment to the improvement of our ship acquisition policies. Our staffs are working closely with the Naval Material Command to establish a broad based program to implement the study. In addition, priority items have been, and will continue to be, identified that will involve participation at the highest levels in the Navy. I am hopeful that the resulting actions will significantly strengthen the management of our shipbuilding process.

There are five essential components to the Navy's efforts to improve its shipbuilding acquisition performance:

1. First is better definition and planning for ship acquisition. Improvement in the quality of plans and specifications, substantial contract involvement in the design process, greater use of test and evaluation and full scale mockup, and a greater interval between lead and follow ships in order to allow more design maturity prior to the transfer of risk to the shipbuilder are prime examples of what has been and is being done to improve overall management.

2. The second component seeks to achieve a better definition and distribution of risk assumption by the Navy and the contractor. Included here are flexibility in the choice of contract type, realistic target to ceiling spreads, and reasonable protection from inflation beyond the shipbuilder's control. These actions are already an integral part of current shipbuilding contracts and will be maintained for future contracts. An example of our new approach is the cost-plus-award-fee contract recently let for construction of the lead ship of the DDG–47 class.

3. The third action category relates to the management of change, particularly referred to in the Committee's Report. The first emphasis is to limit changes to those that are really necessary. Then, every effort must be made to avoid building up a change backlog and to insure that changes are fully priced out without reservations for delay and disruption. The Navy is exploring the difficult course of arriving at a formula, with flexibility to meet divergent circumstances, for advance agreement with the shipbuilder on various cost factors, including delay, disruption and acceleration. If agreement can be reached on these factors in advance, the process of pricing out changes would obviously be greatly facilitated and the potential for claims considerably reduced.

4. The fourth category relates to productivity problems. The Navy in cooperation with the Departments of Labor and Commerce is investigating pilot or demonstration shipyard training projects to expand formal skills training in both public and private shipyards, using funding from the Department of Labor's Comprehensive Employment and Training Act (CETA) (Public Law 93–203). This program should help to reverse declining productivity and improve manning levels in these shipyards. Of course, the primary emphasis for productivity improvement in the private shipyards must come from the shipbuilders themselves, and we will do all we can to encourage them in that direction.

5. The final category relates to the continuing improvement of the qualifications of Government personnel involved in shipbuilding acquisition, including both technical and contracting personnel in the field and at headquarters. The Navy has established claims avoidance positions at each of the Supervisor of Shipbuilding Offices in an attempt to identify problems early, and deal with them in a cost effective manner. There are a number of training initiatives underway to deal with this search for improved management.

While it is necessary to administer contracts on a pay-as-you-go basis, it is also necessary to ensure against the payment of fraudulent claims. Although these objectives may appear to be inconsistent, we believe that they are both obtainable. As stated above, improved contract administration procedures will aid in keeping contracts on schedule and within budget. These same procedures will also keep contract personnel in closer contact with contractual developments and will therefore help in the discovery of fraudulent claims.

Once a claim is discovered to be or is suspected of being fraudulent, we believe that the existing statutes and regulations suffice to protect the Government's interests. On the statutory side, the recent Contract Disputes Act of 1978, P.L. 95-563, has added new measures to protect against fraudulent claims. This Act provides for a penalty equal to the claimed amount to be assessed against anyone making a fraudulent claim under a Government contract. Thus, it will no longer be necessary to provide damages in order to obtain a sizeable recovery from a false claimant. In addition, the new Act requires each claim in excess of $50,000 to be certified. On the regulatory side, two instructions, SECNAVINST 4385.1B of 20 April 1973, and SECNAVINST 5520.3 of 16 July 1975, state the procedures to be followed if a claim is suspected of being fraudulent, in whole or in part. As part of the training given to contract personnel, they will be told of the necessity to inform the NAVMAT Inspector General whenever they suspect a fraudulent claim. Each such claim would be promptly investigated and, if any indication of fraud is found, referred to the Department of Justice.

The Navy understands that the Congress expects improved performance from both the Navy and its shipbuilders, and we agree with this objective. We will do everything in our power to respond to this challenge by insuring that shipbuilding contracts reflect sound technical and business judgments so that they can be administered on a pay-as-you-go basis over the long ship construction cycle. As you are fully aware, shipbuilding is a complex and lengthy undertaking, requiring participation and support by a large number of people and organizations both within and outside the Navy. The very complexity and difficulty of this undertaking underscores our reliance upon the wisdom and guidance you and your Committee can provide the Navy in pursuing an effective and businesslike shipbuilding program.

We take this opportunity to express our gratitude for the support given and the confidence shown by your Committee in our Public Law 85-804 settlements.

Sincerely,

W. GRAHAM CLAYTOR, JR.,
Secretary of the Navy.

Mr. FAZIO. Mr. Chairman, are we going to have more opportunity in executive session today and possibly tomorrow?

Mr. BENNETT. I am not trying to cut you off.

Mr. FAZIO. I would be happy to pass on. I just hope we have further opportunity to go into detail.

Mr. BENNETT. I think we will.

Mr. Trible?

Mr. TRIBLE. Admiral——

Admiral RICKOVER. May I add one answer. I can assure you to the best of my knowledge the claims issue has not been settled and you can anticipate future claims.

Mr. FAZIO. Thank you.

LACK OF LEADERSHIP OF SHIPBUILDING

Mr. TRIBLE. Admiral, I share many of the concerns you voiced here today. In my judgment, many if not most of our shipbuilding problems can be attributed to the lack of leadership in the area of shipbuilding.

Our civilian officials have simply failed to provide the purpose and direction required. I believe that you will see this committee taking a much more active role in the future under the able chairmanship of Mr. Bennett.

I think these hearings today and the hearings that will follow are evidence of the fact that the legislative branch is going to come forward and begin to help formulate shipbuilding policy and not simply defer to the executive branch, as has been the case in the past.

Admiral RICKOVER. That would be a very hopeful sign. I am glad you are taking it over.

Mr. TRIBLE. Let me be more specific now, after having made that opening statement. I am pleased——

Admiral RICKOVER. You notice how I answered you, in very simple terms.

Mr. TRIBLE. I am pleased that you agree. I share your view that we need to proceed full speed ahead with the building of the highly capable 688 submarine. I also share your concerns voiced here today about the need to maintain a viable shipbuilding base.

To that, let me quote from an article in the Norwich Bulletin of Monday, May 21, 1979 which restates the public views expressed by the chairman and chief executive officer of General Dynamics, David Lewis.

Mr. Lewis said, and I quote, "We are in the submarine business and we want to be the only one and the best one without any question." Now coupled with that we know our civilian leadership in the Navy and the Defense Department is now supporting a submarine building program that will simply sustain only one yard.

IMPACT OF ONLY ONE SHIPYARD BUILDING ATTACK SUBMARINE

Now, my question is, what in your judgment would be the consequences to our naval submarine building program if we went to only one shipyard?

Admiral RICKOVER. Well, I would like to paraphrase a very well-known and famous statement. What is good for General Dynamics is not necessarily good for the United States. I think you know what I am referring to.

That was one made about General Motors. I don't think it would be good for the United States to have all our submarine building concentrated in one company. Certainly from the standpoint if we are going to prepare for war, we have got to have more than one source of supply. It is the only way we can get material on time, it is the only way we can have reasonable competition.

Now, I happen to know that you come from the area of Newport News, and that you are interested in Newport News. Is that a statement of fact?

Mr. TRIBLE. That is a fair statement, Admiral.

Admiral RICKOVER. I think it is more than a fair statement, but Newport News is a good yard. They build good ships. They certainly should be kept in this game. I think it is essential from a national standpoint we have more than one yard building submarines.

So I am all for you, not because I like you or Newport News, but because it is good for the United States. I want to make that clear.

Mr. TRIBLE. Admiral, I know you and I both put national interests ahead of parochial interests.

Admiral RICKOVER. Well, I am not so sure about you. [Laughter.]

Mr. TRIBLE. Admiral, I thought you and I were getting off to a good start.

Admiral RICKOVER. We are off—if you get the ships.

Mr. TRIBLE. It has been a little stormy in the past. I am pleased that the Sun is now shining.

Admiral RICKOVER. Even with the last statement I made?

ADEQUACY OF NAVY FORCE LEVEL OF 90 ATTACK SUBMARINES

Mr. TRIBLE. No, that was a good statement. I will accept that. Let me direct your attention to the question of a minimum force level.

In your statement and here today in your testimony you have suggested that the CNO has heretofore established a 90 force level for attack submarines. You were asked directly by the chairman to assess the validity of that figure. You very properly said that this was not your responsibility.

Let me direct a somewhat different question and one that I believe you can answer.

Is it fair to say that since the establishment of that minimum force level that the Soviet threat has dramatically increased?

Admiral RICKOVER. I think I could answer in a simpler way. What if we said 180, what difference would it make? It would take so many years to catch up that it becomes an academic question. We should increase the rate of building submarines and not worry about the 90 or 120. It doesn't really make any difference at this time.

Mr. TRIBLE. You are saying we need to get on with building ships?

Admiral RICKOVER. Yes; we need to get on with building more of them.

OPTIMUM BUILDING RATE

Mr. TRIBLE. And what in your judgment would be an optimum building rate, in order to sustain the shipbuilding base?

Admiral RICKOVER. I have the figure—this committee cannot decide just to have so many submarines, and get it through Congress.

Mr. TRIBLE. Remember, that is our function. You said earlier that the Navy makes a mistake when they make that judgment for the Congress.

Admiral RICKOVER. I apologize for my misstatement. I would go for about five a year for a while. I think that would be a reasonable number to build. We can do that, but whether you get the appropriation, whether the administration will support it, I don't know.

Mr. TRIBLE. I sense that the American people and the Congress are becoming more aware of the Soviet power and presence in the world and perhaps that bodes well for the naval shipbuilding company.

Admiral RICKOVER. I get lots of mail, Mr. Trible, from various people around the country. My perception is that they think that the nuclear submarine is about as important as any part of our Defense Establishment.

This is what I gather. I am not saying that because I am pushing nuclear submarines. I believe you would find very popular support for a program of that kind.

Mr. TRIBLE. I thank you, Admiral, for your past contribution and for your contribution here today.

Admiral RICKOVER. Well, you are making a good contribution to Newport News, too. I hope they remember that when the time comes, in November.

Mr. TRIBLE. Admiral, maybe I could get you down there next year.

Admiral RICKOVER. You can get me down there, but not to campaign.

Mr. TRIBLE. No, I wouldn't want to take that chance. Let me yield back to the chairman the balance of my time.

Once again, thank you for being here. I am pleased that with the assistance of this subcommittee we were able to add a second nuclear attack submarine, which I am sure the Navy will be able to put to good use.

Admiral RICKOVER. Thank you, sir.

Mr. BENNETT. Mrs. Byron?

CONCERN ON SUBMARINE DEPTH CAPABILITY

Mrs. BYRON. Yes.

Admiral, as a new member of this subcommittee, one that has no shipbuilding capabilities in their district——

Admiral RICKOVER. You look pretty young to be a Congresswoman.

Mrs. BYRON [continuing]. I come with some questions that possibly don't come up from some of my colleagues. The testimony we have been listening to is the fact that we must go to a more economical, cheaper type submarine.

First came the testimony that the Russians are working diligently to increase their speed and their depth. It is my understanding that we have decided to go with speed as opposed to increasing our depth.

Then it moved along a little bit to the fact that we might be willing to sacrifice a little bit on our speed if we could cut costs. I think we are talking about a 25 to 30 percent saving per submarine which would give us three to four per year, as opposed to two to three per year.

But right now it is my understanding that we are also just appropriating one, except for this year which hopefully it looks like we will get two submarines appropriated. You add the inflation factor to that.

The thing that concerns me is we have eliminated the concern on depth. We are now minimizing our concern on speed. Yet, we have no guarantee that we are going to get increases in numbers.

Could you give just a very quick comment on the fact that we have gone to slower speed and not a massive thrust toward depth, which in my estimation would have been an important factor—the third factor being quietness.

Admiral RICKOVER. In my opinion this is a complete dereliction of duty by the officials responsible. They are put in that job to help keep this country strong. There is no other purpose. Yet, their actions have been to the contrary.

They are approaching it entirely, for some fiscal reason, with which I am not familiar. The fiscal situation is really up to Congress. I was chided properly by the chairman for not sticking to that point earlier.

I repeat that the Navy should tell this committee what it wants and not try to forejudge or prejudge the decision. This committee, since it is responsible in accordance with the Constitution, this committee must decide, and it is within its legal prerogative to decide what we should have.

IMPORTANCE OF SPEED VERSUS DEPTH

Mrs. BYRON. They had me convinced that speed was a much more important factor than depth. I was willing to give on that point a little. By the same criteria, I will not give on the fact that speed is not an important factor.

Admiral RICKOVER. I think that speed is very important. I consider it is more important than depth. I would like to have both. On the other hand, for us to get depth, we would have to develop a new material which will take many years and is going to be very expensive.

This issue has come up previously, about depth, and the kind of material. It has been my judgment, up to this time, that it is not worth the huge extra effort for American industry to get into that. I would much rather see us go for speed than for depth.

Depth has its advantages, but it is not anywhere near as great an advantage because even though the submarine has the greater depth capability, it is very dangerous because you don't have room to maneuver.

If you go down as deep as you can, you are taking a great risk. I would rather see the speed. I would like to have both of them, but I think that is the thrust of your question, which would I rather have.

Mrs. BYRON. The thrust of my question is I was willing to give up on the depth factor for speed. But now we are getting back to us, where we are going to give up on the depth factor and give up on the speed factor, and what is left is the quietness.

Are they going to come back next and say we are going to give up a little bit on the quietness?

Admiral RICKOVER. No; I would certainly do everything I could to stop that because that is the only remaining advantage we have in submarines. But I would like to see us catch up partly by going to greater speed.

Mrs. BYRON. Thank you. No further questions.

[The following questions were submitted to the witness to be answered for the record.]

Mr. BENNETT. Admiral, would you give us your views on the relative capability of the Soviet and U.S. attack submarine forces?

Admiral RICKOVER. The Soviets are clearly building a first class attack and cruise missile nuclear submarine force. They are building these submarines in large quantities and they are rapidly improving the quality of their submarines. The Soviets surpassed the United States in number of attack and cruise missile nuclear submarines in 1962 and have been widening that lead ever since. They first introduced submarine launched anti-ship cruise missiles into their nuclear submarine fleet in the early 1960's. The United States is just now introducing cruise missiles into our submarine fleet. They have also placed great emphasis on high speed capability. In fact, there have been recent press reports of a Soviet attack submarine with both very high speed and deep depth capability. One area in which we still apparently have a lead is in the area of radiated noise. However, we should expect the Soviets to be capable of making improvements in this area. Keep in mind that there are five important characteristics of the design capabilities of a nuclear submarine—weapons, sensors, speed, depth and noise. It should be sobering enough that the Soviets have apparently already demonstrated a superiority over the United States in two of these areas—speed and depth. They also have had a lead in submarine launched cruise missiles for many years. If they now begin to make major advances in reducing the radiated noise of their submarines or further improving their weapons and sensors, the U.S. submarine force could suddenly be at a significant disadvantage.

Mr. BENNETT. There have been reports that some in the defense community consider that the ASW problem has been solved and that we don't need to build more high speed submarines to handle the Soviet threat. Can you tell us where this idea comes from and what your thoughts are in this regard?

Admiral RICKOVER. I can only speculate that this idea is being promulgated by those who have an interest in spending money elsewhere and who want to believe that there have been advances in U.S. ASW technology that have made the Soviet submarine threat go away.

I know of no breakthroughs in the technology of anti-submarine warfare or in any other situation which has made the Soviet submarine threat disappear or decrease in severity. As in every area of warfare, advances are being made in ASW. But, while we made advances, our potential enemies are also making advances to counter what we are doing. This is always the way it happens and you can only strive to maintain a sufficient qualitative edge to be able to defeat your opponents should war break out. I know of nothing we have done that has so tipped the balance in ASW that we can say that the submarine threat is solved. Indeed, those who make such statements are being highly irresponsible and apparently do not understand the nature of warfare at sea. Although there have been some improvements in our ASW technology, such as the high speed and improved sonar capability of the *Los Angeles* class, these advances have not overcome the rapidly increasing quantity and quality of the Soviet submarine fleet.

Mr. BENNETT. Admiral, we have heard that Electric Boat Division of General Dynamics has developed a design for a reduced cost attack submarine. Could you tell us what you know of this submarine design and give us your opinions regarding the design?

Admiral RICKOVER. Electric Boat Division has given briefings to a wide variety of Government officials on their concept of a reduced cost nuclear attack submarine which they call a "New SSN Design for Reduced Cost". In their briefings on this subject, they compare this ship to the *Los Angeles* Class. However, the reduction in cost compared to the *Los Angeles* Class which is claimed by Electric Boat is primarily accomplished by reducing the ship's propulsion power, and thus its speed, and by eliminating many of the redundant or back-up components and systems which are essential for a combatant ship.

Starting with the *Nautilus*, I have required that our nuclear submarines have redundant components or sytems in order to limit the adverse effect on operation and safety caused by the loss of one system or component. Without redundancy or backups, a submarine could be lost in wartime.

I do not know of any responsible official in the Navy who would accept the design suggested by Electric Boat. Admiral Griffiths, the Deputy Chief of Naval Operations for Submarine Warfare has discussed this with me and had told me that both he and the submarine fleet commanders agree that the lack of redundancy shown in the Electric Boat design would be unacceptable for a combatant submarine. Also Captain Martin, who is the Navy's Supervisor of Shipbuilding at Electric Boat and an experienced Naval engineering duty officer, has written a letter dated September 25, 1979, which points out the basic design deficiencies in the Electric Boat design. Mr. Chairman, with your permission, I would like to provide a copy of ths letter, which is classified, for insertion in the record.

An example of how Electric Boat would reduce submarine cost and size is elimination of the secondary propulsion motor. This equipment is provided to enable the submarine to return to port if the main propeller shaft or propeller fails. Also, Electric Boat would eliminate the snorkel capability for the diesel engine. This would result in requiring the submarine to surface for emergency ventilation for operation of the diesel engine. In wartime a submarine on the surface would be an easy target for the enemy. Many other features considered vital for a combatant submarine design have also been left out of the Electric Boat design.

It is surprising that Electric Boat with their many years of submarine design experience would even consider deleting backup and safety features required in a combatant ship, especially because Electric Boat employs senior ex-submarine officers whose combined experience covers many years of submarine operations. I can only conclude that these officers' military sense is being compromised in the name of commercial opportunity.

SUPERVISOR OF SHIPBUILDING,
CONVERSION AND REPAIR, USN,
Groton, Conn., September 25, 1979.

Adm. C. R. BRYAN, USN,
Commander, Naval Sea Systems Command, Department of the Navy, Washington, D.C.

DEAR ADMIRAL BRYAN: The purpose of this letter is to express to you my deep professional concern with some of the small submarine conceptual studies that have been brought forward in recent months. In particular, two of these—the so called SSNX Baseline Submarine, and the high speed, deep diving, automated submarine—which have been studied by Electric Boat Division on their own initiative, have serious technical shortcomings as viable combat vehicles.

An underlying premise of the baseline study has been to provide minimum or no redundancy. It is by this technique, rather than through application of any new technology, that the size and presumably, the cost of the submarine would be reduced when compared to current operating ships. Redundancy is one of the most vital design requirements for safety, reasonable mission endurance, and extended operating cycles. Several examples clearly highly this point.

The baseline study has a single hydraulic plant [deleted] compared to two plants [deleted] in the *Los Angeles* (SSN–688) class. The hydraulic system can will be compared to the blood circulatory system of a human being. With only one plant, the loss of it or any significant portion would make the submarine inoperable. In another instance, the baseline study has a single [deleted] distilling plant, whereas the *Los Angeles* class has both a [deleted] distilling plant. These components are essential for makeup feed to the steam propulsion plant, as well as the personnel requirements for potable water. Outage of the single distilling plant for other than a few hours would require a mission to be aborted. In fact, if the submarine were deployed far from its base and the single plant became inoperative, the ship most probably could not return home because of makeup feed requirements. In no way would one want to take such a submarine under the Artic icecap in winter. Still another example concerns the air conditioning plants. The baseline study has [deleted] units, while the *Los Angeles* class has [deleted] units. From the very first introduction of steam propulsion plants into the closed environment of a submarine hull, the Navy has recognized the necessity for adequate air conditioning capacity to handle the attendant heat loads of normal operation, as well as potential casualty conditions. Further, the ever incresing complexity of the electronics associated with weapons and sensors systems have demanded very stable, controlled atmospheric conditions within the hull and equipments. Loss of any significant portion of air conditioning capacity in the baseline concept could well render these sensors and weapons systems useless, as well as seriously degrade the capability to handle propulsion plant problems. In addition to the above, the lack of redundancy in the baseline study encompasses almost all major systems and components outside of the reactor plant, [deleted].

Another example of technical inadequacy with the baseline submarine concerns the elimination of corrosion allowance for the hull plating and structure. While this poses no immediate problem with a new ship, it removes margin when the ship is nearing the end of its useful life, at just that point in time when margins are perhaps most vital.

The baseline study supposedly does not modify the primary plant or its systems and components. However, the major changes in the secondary plant would required a careful review from a reactor safeguards standpoint and most likely would be inadequate. It should be remembered that the recent Three Mile Island commercial reactor accident involved secondary plant systems. Nuclear power is unforgiving when errors are made and therefore, the Navy has always been properly conservative. It has provided within the design, capability to satisfactorily handle credible potential accident conditions. No other approach is technically acceptable.

It is very easy to allege substantial weight or cost savings for a preliminary concept, since the detail is not present to permit adequate technical evaluation. It is a relatively simple matter to make reductions when only a vague concept is presented, because the technical details can be glossed over. Historically, as the details of system and component designs are developed and the concept is made workable, the initial optimistic claims are largely nullified. Further,

a minimum hull envelope and displacement tends to require machinery and systems arrangements which, while they may be operable, are nevertheless very expensive to overhaul and maintain over the life of the ship. These present submarine concepts are similar in many ways to the small, light weight, low cost nuclear propulsion plant concepts put forth repeatedy by major corporations some two decades ago. At that time, my duties involved participation in the technical evaluation for the Navy of those proposals. The same shortcomings of paper cost and weight savings and lack of technical merit existed with them. They were totally unsatisfactory from a technical standpoint.

With the pressures for cost and size reductions applied from higher echelons, where there is often insufficient technical knowledge to properly evaluate concepts, it may be easy to "sell" a proposal that is inadequate. I recognize full well that you are one of the few senior submarine officers still on active duty with submarine combat experience in World War II. You therefore understand clearly the need for redundancy any system flexibilities. It might be well for some of those other naval officers, who advocate reductions or elimination of redundancy, to read the submarine patrol reports and war damage reports of that era to properly comprehend how often redundancy, ruggedness and reliability were the margin between failure of a mission or its success, and between the loss or return of a ship. Of even more recent vintage, those of such persuasion should review the [deleted] and recall that redundancy and system flexibility were vital [deleted].

While even less is known to the Navy concerning Electric Boat's study of a deep diving, high speed, small submarine, an oral statement by a senor official that it is highly automated gives rise to additional concern on that point. The Navy and Electric Boat studied automation concepts for submarines some fifteen years ago. The Navy concluded that it was not technically satisfactory for an across the board application of such technology.

I fully understand that fiscal constraints demand that we consider ways of properly reducing costs. We can and must do this. But it is my view, that we cannot make substantial reductions in costs or size unless reduced performance is deemed acceptable—that is, slower submarines with less depth capability. Others will have to make those basic decisions. However, the Navy should strongly oppose indadequate technical designs regardless of the basic performance characteristics selected—if for no other reason, than that a submarine of any size and capability will still be very expensive and if it is technically inadequate the moneys will have been totally wasted.

In my opinion that the concepts referred to above are not technically adequate to perform peacetime under ice operations nor [deleted] and without question, not acceptable for wartime operations. The cliche that those who will not learn from experience are doomed to repeat it seems applicable here. To satisfy pressures through an inadequate or marginal design would indeed be a poor legacy to bestow upon the young who will man our submarine fleet in the future. The Navy technical community has the experience and the knowledge to produce good ships, and we must marshal the intestinal fortitude to apply it once more in the face of considerable political and economic pressures for compromise.

In conclusion, I strongly urge that the technical deficiencies of these and similar inadequate concepts be brought to the attention of all of those in the government (of whom we have knowledge) who may have been exposed to these studies or concepts.

Very respectfully,

W. L. MARTIN III,
Captain, USN.

Mr. BENNETT. Dr. Mann stated that his study shows that we could save 25 to 30 percent in the cost of a new attack submarine with reduced maximum speed capability and then buy three or four of these less capable submarines instead of two or three SSN688 Class units. Even if you could get someone to make a commitment to buy more of the cheaper submarines—which you cannot—it would change with every new budget. Do you think proceeding with a slower cost, less capable attack submarine would, in fact, result in an increased number of these submarines in the shipbuilding program.

Admiral RICKOVER. I have no reason to believe that it would. Building a cheaper submarine so you can buy more is the basis frequently cited to support reducing the capabilities of our submarines. What you are doing, of course, is trading known capabilities that are essential for the submarine mission our attack submarines must perform for some future uncertain promise of building more ships. The old adage, "A bird in the hand is worth two in the bush.", could not be more relevant than it is in this case.

The same argument was made when we were trying to get approval for the *Nautilus*. The argument was you could build more diesel submarines for the price of the *Nautilus*; thus we should not proceed to improve our submarine capability.

As this Committee is aware, the Defense Department is constantly playing the construction deferral game. To save money each year they cut the number of ships. However, they try to appease everyone by showing they have only deferred building them until some later budget year. Then, the next fiscal year we go through the same process with the result that construction of adequate numbers is deferred indefinitely. Meanwhile, the costs are going up so the budget analysts push for even greater cuts in the next fiscal year.

We simply have no long term attack submarine shipbuilding program and it is only through efforts of this committee and the Congress that we have any nuclear submarines being built at all.

Mr. BENNETT. Admiral, you have mentioned in your opening statement that attack submarine related research and development suffers from a lack of funding and from poor planning. Would you please explain these statements more fully?

Admiral RICKOVER. The situation with regard to attack submarine related research and development is just one more outgrowth of the Defense Department's continued refusal to recognize the importance of the attack submarine in our national defense. The funding devoted to attack submarine research and development, like that devoted to submarine construction, is woefully inadequate. As a result, much need and useful work is not being done or is being funded at such a low level as to be practically useless. Rather than a well rounded, well planned program in all submarine related areas, we have one in which priorities and emphasis constantly shift in response to new problems or new people in management positions.

One area in which this is particularly true is in hydrodynamics. As the person responsible for providing the propulsion power for our nuclear submarines, I have been trying for many years, with only limited success, to get the Navy to pursue a comprehensive hydrodynamics research program to permit the optiumum ultilization of the propulsion power produced by my reactor plants. It has recently come to my attention that there are potentially important developments in hydrodynamics which are apparently being pursued in other countries but which are being almost completely ignored in this country. One might logically ask: "Who in the U.S. Navy is reviewing and evaluating foreign developments in submarine hydrodynamics to see what can apply to our own programs or what new capability our potential adversary might be developing?" The answer, simply put, is: no one. The limited funding available apparently does not allow any priority to be placed in this potentially fruitful area.

The Soviets clearly do not have similar problems with their submarine research and development program. The rapid improvement we are now seeing in the capability of their submarines provides evidence of a longterm, well planned, heavily funded submarine research and development program. There is ample evidence of their continued commitment to improvement in the capibility of their submarines.

There is not evidence of such continuing commitment on the part of the U.S. Navy. If we are to maintain the qualitative advantages which we seem to be counting on to counter the large Soviet advantage in numbers of nuclear submarines, we must stop wasting our time, effort and money looking for ways to make our submarines cheaper and less effective and develop a well-funded. coherent, comprehensive attack submarine related research and development program.

I would suggest that you may want to ask your colleagues in the House Armed Services Subcommittee on Research and Development to investigate this matter further.

Mr. BENNETT. Admiral, you mentioned in your opening statement that the *Los Angeles* class has demonstrated its superior capabilities in actual operations. Would you describe some of these operations and give us your views on the further improvements we should expect to see in the performance of this ship?

Admiral RICKOVER. There have been numerous reports of successful missions in which the superior speed capability of the *Los Angeles* class enabled her to accomplish tasks which no other U.S. submarines could perform or to significantly out-perform older, slower submarines. Here are a few examples:

In a recent exercise, a *Los Angeles* class submarine demonstrated her unique ability to maintain contact at a safe distance on a high speed target for long periods of time. Her superior speed enabled her to maintain contact even though frequent course changes were required to accurately determine the position of the target. No other U.S. submarine could do this.

In some exercises where a *Los Angeles* class submarine commander has suspected that his ship has been counter-detected by the target at close range, he was able to use flank speed to rapidly open the range from the target.

In another exercise, the *Los Angeles* and a slower *Sturgeon* class submarine were operating as direct support escorts for a simulated fast surface task group. Other U.S. SSN's simulated nuclear submarines attacking the task group. At high task force speeds where the *Sturgeon* class submarine was unable to perform effectively, the *Los Angeles* demonstrated the ability to detect and attack all targets presented.

In another exercise, both a *Sturgeon* class submarine and a *Los Angeles* class submarine were assigned the function of preventing simulated Soviet submarines from transiting through a barrier region which the submarines were defending. Although both classes of submarines were able to detect the approaching target submarines, the *Los Angeles* class demonstrated superior ability to conduct a more efficient search and detect more submarines faster and at a longer range. The combination of the higher speed and improved sonar again demonstrated the *Los Angeles* to be a superior class of attack submarine.

In one exercise a *Los Angeles* class submarine was pitted against a non-nuclear aircraft carrier task force which was transiting the Atlantic. Although many exercises are constrained in such a manner that the true capability of the submarines cannot be demonstrated, this is one which approximated actual operating conditions. The *Los Angeles* class submarine initially detected the carrier task group at a long range, conducted a high speed pursuit and launched an undetected torpedo attack on the task force. A *Sturgeon* class submarine could not have accomplished the high speed pursuit which got the ship in position to attack.

In a recent exercise, the USS *Los Angeles* and two other nuclear submarines assumed the roles of cruise missile launching submarines and simulated attacks on a task group centered around the conventional aircraft carrier, USS *Ranger*. During this exercise, *Los Angeles* frequently used her high speed capability to maintain contact with the surface task group, even at task force speed which caused the other nuclear submarines to fall behind and lost contact. The *Los Angeles* launched fourteen separate simulated torpedo and missile attacks against the *Ranger* and her supporting ships.

A letter I recently received from the Commander of the Submarine Force in the Pacific states that he has gained a high appreciation for the value of the *Los Angeles* class SSN as compared with the older *Sturgeon* class. He makes the following observations concerning recent *Los Angeles* class operations in the Pacific:

a. In one instance the *Los Angeles* made a high speed transit [deleted] in order to participate in an important Seventh Fleet exercise. No other class of submarine would have been able to make this transit in the time required.

b. Because of her greater speed capability, the *Los Angeles* is able to search a significantly greater area than a *Sturgeon* class submarine in the same amount of time.

c. In one recent exercise the *Los Angeles* was able to maintain contact and repeatedly simulate close range attacks on an aircraft carrier that was operating at high speed. No other class of submarine could have kept up with the carrier at those speeds.

d. While escorting a high speed aircraft carrier task force, the *Los Angeles* was ordered to investigate a contact astern of the carrier. She left the task force, searched for several hours and rejoined the task force eight hours later. Such an impromptu search could not have been performed with other classes of subma-

rines which do not have the speed capability required to rejoin the task force in a reasonable time after the search.

e. In another exercise the *Los Angeles* was counter detected while communicating with another ship following a simulated attack by the *Los Angeles*. Her high speed capability enabled *Los Angeles* to clear the area before any effective counterattack could be launched.

f. Because the *Los Angeles* class can reach an assigned location faster and search a given ocean area more quickly, they are being assigned to short notice, high priority tasks in preference of other classes.

Mr. Chairman, with your permission I would like to provide a copy of this letter from the Commander, Submarine Force in the Pacific, for the record.

It must be remembered that these ships are still relatively new to the fleet. They are like any other new development. The first efforts to use them are slow and conservative. The operators tend to stick to what worked well for them in the past. Gradually, they begin to learn that the old restrictions do not apply, that this new ship has capabilities beyond anything they had before. The operators of the *Los Angeles* class and the ships have performed well. But the operators were trained on the older, slower submarines that have been the mainstay of our fleet. The tactics they learned to use were also developed on these old ships. The operators are embarking on a tactics development program; however, the training requirements imposed by this new ship and her totally new combat system and the heavy demand for these ships for other missions is such that the development of new tactics is moving slowly. Gradually, as new tactics are developed, as missions are performed which could not be done before, and as the operators learn to fully use the capabilities of this ship, the value of the *Los Angeles* class will be found to be greater than it is today.

Mr. BENNETT. Admiral, Dr. Mann testified that the Navy's decision on what design of nuclear attack submarine it wants to build starting in fiscal year 1983 would be based on the results of the CNO's Fleet Attack Submarine Study which is currently underway. Dr. Mann further testified that the difference in speed between the *Sturgeon* (SSN 637) class and the *Los Angeles* (SSN 688) class would make a significant difference in effectiveness. What is the difference in speed of the submarines being considered in the CNO's Fleet Attack Submarine Study?

Admiral RICKOVER. The Fleet Attack Submarine Study is considering two submarine designs, both of which are improvements of existing submarines. Both ships are being designed to have the same combat systems and the same depth capability but different speeds.

I cannot state the specific ship speeds in open session, but the difference in the speed of the two improved designs is expected to be about the same as the difference in speed of the current SSN 637 and SSN 688 classes. Therefore, the higher speed submarine being considered in the study would be much more effective than the slower one.

The costs and effectiveness of these two improved designs are being analyzed on the same basis as was used for Dr. Mann's Submarine Alternatives Study. Based on the prior results of the study, I expect that the higher speed submarine will be shown by the analysis to be more cost effective. In any case, when operational factors not included in the study—many of which have been discussed in your prior hearings—are considered, the higher speed submarine is clearly a better buy.

In my view, it is time that we face up to the reality that we cannot afford to reduce the capability of our future submarines at a time when we see convincing evidence that the Soviets are making tremendous strides in improving theirs. Instead of tying up all our submarine design talent on studies of how to reduce the capability and cost of our submarines—as we have done for the past eighteen months—we should put the effort into how to improve our submarine capabilities. While we make cost-effectiveness analyses, the Soviets make technical progess. We can no longer afford this waste of our people's talents!

Mr. BENNETT. Admiral, in these hearings we have spent a great deal of time discussing the Submarine Alternatives Study recently completed by the Navy. Could you give us your comments on the methods of analysis used in this study and its applicability to making the decisions as to what type of submarine to build?

Admiral RICKOVER. As these sorts of things go, this study was not as bad as some I have seen. Experienced submarine operators participated in the study to ensure that the analyses of various mission scenarios were as realistic as possible within the limits of analysis.

However, in addition to being biased from the outset since attention was directed to less costly submarines which were operationally adequate rather than to improving on what we already have, the study also had the typical limitations of numerical analyses. For example:

First, these analyses are conducted by running hundreds of replications of each mission situation so that the resulting average will be "statistically meaningful". Unfortunately, a submarine commander does not get hundreds of chances at an enemy. The victory will go to the ships that can bring the most capability, talent, training and luck together in one encounter to defeat the enemy.

Second, a fundamental weakness of these numerical analyses is that they are unable to evaluate the role of ship's speeds in enabling the ship to recover from the inevitable miscalculations, errors in judgment, equipment failures, or incorrect choices of tactics which may have caused the ship to lose its tactical advantage. This, obviously, is very unrealistic.

Third, a fatal flaw in all of these studies is the need to predict what the enemy threat will be in the time 20 to 30 years from now when these submarines are in the fleet. This simply cannot be done. To further limit our own capabilities based on such attempts to predict the future would seem to me to border on irresponsibility.

Fourth, several attack submarine missions were not included in the numerical analyses. These include the direct support mission, the trailing mission, and the power projection missions where the submarine penetrates deep within enemy controlled water to deliver land attack cruise missiles. As VADM Griffiths told you in his testimony last week, speed is important in all these missions.

Fifth, most of the mission analyses began with the U.S. submarine in an advantageous tactical position with respect to the enemy. Thus, speed would not be required to catch the target. In addition, none of the analyses evaluated the case where it is necessary to reattack the target or the case of multiple targets. The study acknowledges that these are cases where speed is a benefit.

Sixth, since many tactical situations are too complex for the computer to analyze, they were not included in the analysis. Clearly, in a situation such as the firing of a weapon by a U.S. submarine in the middle of a task force, high speed would be of value in evading counter attacks, reacquiring targets, and attacking ships that may attempt to escape at high speed.

In spite of all this, the results of the study, as I understand them, clearly show that by most methods of comparison, the faster submarine—that is, those based on the *Los Angeles* design—are the most cost-effective. This means that the higher cost of these submarines is more than offset by their increased effectiveness in the tactical situations which were analyzed.

Clearly, it would be a serious mistake to base a decision as to what type of submarine to build on such a study. Although these studies may be of limited use in determining the effect on performance of various changes in ship characteristics, it is the knowledge and experience of seasoned submariners which must be relied upon to determine the course of submarine construction. The entire submarine community, both operators and engineers, recognize that our real need is to upgrade to SSN-688 class and further improve its already remarkable capabilities. Just think how much further ahead we would now be if we had put all those people and man-hours to such a productive use for the last year and a half.

DIESEL SUBMARINES

Mr. BENNETT. Mr. Trible, you suggested to the staff that maybe you would like to have a hearing on diesel submarines. Why could that not be in the same hearing.

Mr. TRIBLE. I suggested to the staff that there are a number of areas that I think we should investigate just for our general information. In that regard, I would like to spend some time learning more about what the British are doing with the Invincible and the Harrier aircraft.

I know that we could have British Navy people present testimony, along with British aerospace, who are responsible for the Harrier, and for the Ski-Jump use of that aircraft.

Moreover, I believe that arguably there are some missions for which we could use nonnuclear submarines. We should consider the capabili-

ties of that submarine in order to fairly evaluate the needs and requirements of our Navy.

To that end, I know the Germans are building subs of a nonnuclear variety and exporting those around the world. I submitted to Mr. Hale the names of witnesses that would be available to just provide some general information.

Mr. BENNETT. How does the committee feel about that. I don't think the Harrier has a point this hearing. But how about the diesel subs? You think we should extend it to that? Well, suppose we set up another hearing before we conclude this, and have the diesel subs come in, too.

We have approached a number of things other than just this cheap sub in this hearing. We have had a lot of conversation here about the advanced Russian sub. So it seems to be appropriate that we wind it all up in a second hearing.

Admiral RICKOVER. Mr. Chairman, may I make one remark. The Germans are not allowed to build nuclear submarines.

Mr. TRIBLE. I am not arguing for diesel submarines. But I just think that if we are going to make these intelligent decisions, that we need to have the benefit of as much information as possible.

To that end, if we could schedule some additional hearings, I think they would be most valuable.

Mr. BENNETT. We will have one hearing on the subs. I would like to complete one field of activity. We will have another hearing at a time we will set—probably November 5.

Mr. HALE. Yes, sir.

Mr. TRIBLE. Thank you, sir.

Mr. BENNETT. All right.

Now, I think I can discuss this here. I have talked to the committee about going into executive session. Those not cleared for the executive session please leave.

HEARINGS ON 5-YEAR PLAN

I would talk to the committee now for a minute about another matter which has come up; that is, the question of having hearings on the 5-year plan. A lot of you signed a letter on that. Let me tell you my feeling about that.

I am a very candid individual, as you know. My feeling about the hearings is fine, let's have the hearings, but I would be mighty unhappy if I am the only guy that sits here during those hearings.

Before you came to Congress, there were a number of times when this committee came to the conclusion they wanted to have hearings and pressured me into having the hearings, and I was the only person that heard the hearings.

I didn't want the hearings to begin with. They succeeded in entertaining me pretty efficiently and educated me. But the people that wanted the hearings didn't attend. So that is the only negative thing I have about this.

I think it would be good to have hearings. Something needs to be done about the overall planning of the Navy. You have been wonderful in your attendance recently. Everybody has. It is not a criticism of this committee as now constituted.

Now, if you would like to do that, we could have them, starting on November 13.

GREATER SUBCOMMITTEE ROLE IN SHIPBUILDING POLICY

Mr. TEBBLE. Mr. Chairman, the purpose of the letter, which the members of the committee were kind enough to cosign, was the reason stated here today, that we need to play a more active role in formulating shipbuilding policy.

It was my thought that if we could hold a first round of hearings now, we would be much better prepared come January to intelligently assess the testimony and make the right decisions.

Mr. BENNETT. All the members of the subcommittee have signed it. So I assume you want it and you will attend. So we will set up such hearings.

Now, since time is running out—I am not going to kick that around any further, but I will agree to have those hearings. I am just going to urge you all to attend.

[Whereupon, at 11:50 a.m. the subcommittee proceeded into executive session.]

Mr. BENNETT. We will go into executive session at this moment.

We are now in executive session. Does anybody have any questions to ask Admiral Rickover? Do you have any, Mr. Spence?

DIRECTION OF SUBMARINE CONSTRUCTION

Mr. SPENCE. I would ask him the one about the direction in which we should go now in submarine construction, what advances we should make from the standpoint of depth and speed and new types of construction and so forth.

Admiral RICKOVER. I would suggest, sir, that you put into the recommendations, in your report, that you request an advanced SSN 688 class submarine. That would be the best thing.

Mr. BENNETT. Admiral. I want to say to you there has been some testimony earlier in these hearings that maybe an advanced 688 wouldn't be any more expensive than the present 688.

Admiral RICKOVER. It probably would not be much more expensive.

But it appears that the direction of the Navy is to go to inferior submarines. So you see, it is quite a shock to me to find out that there is somebody that wants a better submarine.

Mr. BENNETT. I think Admiral—Mr. Mann or Dr. Mann testified for very little more money, possibly even equivalency, you could have a better 688. I think sometimes when you are not present you might feel people are more antagonistic than they are. Actually, I think Dr. Mann was not a strong supporter of the cheap submarine.

Admiral RICKOVER. But Dr. Mann knew the climate. He had already been warned about the climate in this committee.

Mr. BENNETT. I see.

Mr. FAZIO. It was kind of chilly, actually.

Mr. BENNETT. It was chilly to the idea of building a cheap submarine. The basic end of it was they were not going to build enough cheap submarines, much less the good submarines. In other words,

there was no plan to build enough cheap submarines to have an adequate fleet.

Admiral RICKOVER. Dr. Mann when he gets up in the morning also looks outside to see if it is raining.

Mr. BENNETT. OK. Anybody else have any questions?

SUBMARINE RESEARCH AND DEVELOPMENT

Mr. SPENCE. Yes, Mr. Chairman.

In that connection, from the standpoint of our submarine research and development, which direction are we headed, Admiral? Are we trying to do more, get greater speed?

Admiral RICKOVER. We are not headed in any consistent direction, sir. The submarine research business, with the present type of leadership, is pretty much at a minimum. I think it would take what the chairman just discussed for this committee to mandate an increased submarine research program. There is not a great amount of money involved.

Mr. SPENCE. That is what I wanted to bring out. We are not doing much in R. & D. from the standpoint of submarines.

Admiral RICKOVER. That is correct.

Mr. SPENCE. On the other hand, the Russians have been doing a whole lot. They spend a lot of money to get this [deleted] depth and the speed they have gotten. That is what concerns me. They are doing a lot more, spending a lot more.

Admiral RICKOVER. Mr. Spence, the U.S. Navy is directed more toward aviation than toward submarines. I think you know that. The Russian Navy is directed toward submarines. The U.S. Navy is directed toward aviation. That is the essential difference. The only place you can get an increase in submarines is with this committee.

There is no other committee of Congress that is as familiar with the problem or as dedicated toward pursuing it as this committee.

I was listening to some of the conversation the chairman was having with you. What this conversation said was that this committee should become more directly involved in this program. I heartily agree with that. Because in this committee one can get a hearing at least. There is no other place you can get a real hearing.

DIESEL SUBMARINES

Mr. SPENCE. We mentioned the diesel-powered submarine a while ago, and we will probably have hearings on that. Is there any place, do you think, for diesel-powered submarines in our Navy?

Admiral RICKOVER. Well, if you want to prepare to fight a war right off the coast, yes. You can use diesel submarines. But then again, you get into special purpose submarines; whereas, the nuclear submarine can operate anywhere. Knowing the few submarines we are going to have, it is far wiser to have ones that can be used for any purpose, whether to escort ships, to fight abroad, or to be able to deploy when you cannot get oil.

Now, this is a point that hasn't been mentioned yet today. How about oil? Is that situation going to get better or is it definitely getting

worse? Some day this committee will be praised for the position it took in advocating nuclear power. We are puting nuclear cores in our submarines that can last [deleted] years, without refueling. You can send the ship out to fight, and it doesn't have to be refueled for [deleted] years.

Mr. SPENCE. We just used a lot of your arguments in our fight over the nuclear carrier. We referred to that any number of times. Admiral, what about the Russian high-speed propulsion system they have developed? Do you have much knowledge about that?

Admiral RICKOVER. We can do that, too. We can do things to make high speed. However, for the depth estimated for the *Alfa*, we would have to develop [deleted] hull. That would take many years to develop. The hull would cost 10 times as much as it does now. I would not advocate that. If I were talking now as purely a military man, I would say let's do it right away; that is what they can do in Russia.

But I have to take into account the financial situation of this country. I could not responsibly advocate going to a vast program for developing [deleted].

Even if it were developed, the [deleted] hull would cost 10 times as much as the present steel hull. You see, I take cost into account, also.

Mr. SPENCE. That hull, though, would mainly——

Admiral RICKOVER. Provide greater depth, but you want to know how they get their high speed. [Deleted] we do know certain things they do. We know they don't have the accommodations for their men that we do. We are required to do things in our Navy and in our entire military that no one else does for the comfort of our personnel—it is just part of the game. We cannot get people to enlist if we don't do that and various other things such as provided good food, accommodations, and so on.

Designing our submarines to be quiet [deleted] but making them quiet is very important. That is the big advantage we have. We are [deleted]. That is a tremendous advantage. [Deleted.] So, we presently have this great advantage [deleted].

We can do various other things, [deleted] which I think this committee knows about. They cannot, yet.

Mr. SPENCE. Admiral, what are your views on the CNO's 5,000-ton attack submarine?

Admiral RICKOVER. I would prefer you ask him for the rational explanation for that. I have given my reasons why I believe we should not build slower attack submarines.

Mr. SPENCE. All right.

That is all I have, Mr. Chairman.

Mr. BENNETT. All right.

Mr. Fazio?

DIRECTIONS FOR DEFENSE SPENDING

Mr. FAZIO. Thank you, Mr. Chairman.

A number of things have come to mind since you have been answering Mr. Spence.

You indicated a concern for the overall budget and fiscal status of the country. We are constantly assaulted on this committee with new

and, I think, generally well-supported ideas for additional expenditure.

I had a briefing the other day at Travis Air Force Base in my district for a new transport plane. Obviously, there are people advocating the new long-range bomber. The B–1 is not gone. We have a new M–X missile that is estimated to be from $30 billion to $100 billion, depending on how depressed you might be at a given time.

Where would you make reductions, not only in the naval budget, to allow for greater emphasis in the budget? What is your philosophy and how would that be translated into priorities?

Admiral RICKOVER. I see a couple of things clearly. If we have a nuclear war, then nothing else counts, you don't need attack submarines or any other general purpose forces. But I think that would be the greatest defeat of the human race there could ever be.

I personally doubt that either the Russians or we will ever engage in a nuclear war. I think the consequences are so serious that no matter what political system you have, no one is going to take the step.

We may dislike the Russians, but it is very rarely that you get a man like Hitler. It is a very rare case that a man like that is permitted to run a country. He could have done that. He could have said, if the human race is not capable of carrying out what I think is right, then it deserves to be destroyed.

But I don't think the Russians are that way. So we have to go along on the basis that there will not be an all-out nuclear war. That is the only rational basis on which to proceed.

Do you agree with me? If you did not plan on that basis, there would be no point having this committee. So we must proceed on the basis that there is some sense of having a committee of this type. Therefore, we should build ships that are good enough that could deter the other guy from starting a conventional type of war. That is the only reason I can see.

I am against all these large armament expenditures. I think it is crazy for mankind. But with the real world we face, I don't see a practical alternative at present. I don't believe in unilateral disarmament.

Mr. FAZIO. You would oppose M–X then?

Admiral RICKOVER. Well, I would rather not get into specific details. I cannot take on what another branch of the Defense Department wants.

Mr. FAZIO. Within the Navy, what would you deemphasize?

Admiral RICKOVER. I would emphasize submarines.

Mr. FAZIO. At the expense of what?

Admiral RICKOVER. That is up to the members of this committee.

Mr. FAZIO. That is why we are looking for guidance. I am much less capable of making that decision than you.

Admiral RICKOVER. You are elected a Congressman and therefore you are inherently assigned a great deal of wisdom.

Mr. FAZIO. That frightens me.

Admiral RICKOVER. The chairman is smiling. Maybe he doesn't agree, but I consider since you have one vote you have just as much wisdom as any other member.

Is that a safe thing to say?

Mr. FAZIO. Let me ask a little more detailed question.

We have had recent critics say the Trident program is not only too expensive but is bad strategy in that we are putting too many eggs in one basket. We ought to have smaller submarines with less capability so we present a more difficult target and we are bound to lose more capability at the end of an engagement perhaps.

Admiral RICKOVER. I will express an opinion on that subject.

I think we can build a cheaper Trident-type submarine and I think at a certain point we ought to look at a cheaper one.

I was against the use of 24 missiles in the Trident from the very beginning, as the committee well knows.

Mr. FAZIO. When do we stop?

Admiral RICKOVER. I would not stop any of the ships we are building, but if there are going to be many more, I would try hard to make them smaller and cheaper.

I strongly recommend that this committee look into such a program because it might save money.

Mr. FAZIO. What kind of prototype do you have in mind?

Admiral RICKOVER. I don't believe we need a prototype. We could find you a powerplant. We would use one of our present powerplants that could fit in. I think all you would have to do is make a decision on what kind of missiles you need for the future and how many you want and the ship might be made smaller and cheaper.

Mr. FAZIO. You are advocating going back toward the Polaris to some degree?

Admiral RICKOVER. Yes, sir. That issue has come up many times.

Today, we can build a cheaper ballistic-missile-type submarine. I think it is well worth looking into in a hurry.

Mr. FAZIO. You would take the savings and put them into attack submarines?

Mr. BENNETT. Is that a thing that could be made public or is that secret?

Admiral RICKOVER. Make what public, sir?

Mr. BENNETT. The fact that you are recommending a smaller Trident?

Admiral RICKOVER. I would rather not. You are asking me to talk to you in executive session and I am telling you my off-hand opinion. No, sir, I would rather not. This is a complex subject and would require evaluating many factors we have not discussed before reaching a conclusion.

Mr. BENNETT. That is a very significant statement. I didn't realize that potential existed. If there is a way of saving money out of Trident, we ought to save it.

Admiral RICKOVER. I am not advocating saving money out of Trident for the purpose of getting more attack submarines. If you do save money, I won't get into what use you should put it to.

Mr. FAZIO. You are making a strategic judgment?

Admiral RICKOVER. No, sir. I am saying that in my opinion you might get the same impact with cheaper ships.

Mr. BENNETT. In the Trident field?

Admiral RICKOVER. In the Trident field.

Mr. BENNETT. Not in the attack sub?

Admiral RICKOVER. If I knew how to make an adequate attack submarine cheaper, I would not wait for you to ask me how to do it.

HISTORY OF TRIDENT DESIGN

Mr. LEIGHTON. Mr. Chairman, if I may make a comment, when the Trident submarine was originally designed, the size was mainly set by two basic issues. The first was the size of the missile tube to be provided. The tube size was made to handle what today is called the Trident II missile. It was longer and larger in diameter than the one we have now on ballistic missile submarines. That was a well-known fact at that time. The Trident I missile was deliberately constrained in size so that it could be carried in the missile tubes of our present Poseidon submarines.

The missile people made those decisions. Admiral Rickover has no responsibility in the missile area. The missile people concluded what kind of tube they wanted and how long a tube was required for future missiles. That set the diameter of the submarine hull.

The second issue involved the number of missiles per ship. The length of the submarine was based on how many missiles it would carry. It was decided to put in 24 missiles. Admiral Rickover's personal preference was for 16 missiles.

Admiral RICKOVER. And I recommended that to Secretary of Defense Laird. He thought it over and he said, if I go to the White House now, they may kill the entire program. So even though he agreed with me, on a smaller number of missiles per ship, he didn't recommend the lower number for political reasons.

Mr. LEIGHTON. Admiral Rickover recommended 16. Within the Navy there was agreement on 20. Finally, a Navy position moved forward that Adm. Levering Smith, Admiral Rickover, the CNO, and the Defense Director of Research and Development concurred in that we go to 20 missiles.

It had been decided by OSD to go to 24 and Mr. Laird said, if we reraised the issue, we would lose the program in its entirety. It was due to the cost effectiveness. A 24-missile submarine is cheaper per missile on line.

Admiral Rickover thought we ought to divide it up into more baskets, 16 or 20 missiles per ship. A lot of other people thought so, too. However, when you make the studies, it is cheaper overall to have more missiles per submarine and therefore have fewer submarines.

When the first ship was approved, the Congress insisted that a design of a 20-missile submarine continue forward with the idea that we might go back to 20 later. Every time this issue has come up in the intervening years we have always ended up with the 24 because, when you play it all out, the dollar per missile on the line is cheaper when you go to 24.

When Dr. Schlesinger was Secretary of Defense, he raised the issue of an alternate submarine for the Trident. We looked at that. It was called the SSBN–X. Admiral Rickover supported it.

We talked about a smaller submarine with a different powerplant and fewer missiles. Admiral Rickover agreed with the Secretary of Defense, but when they ran it through the studies and played it out, they concluded it was going to cost more money overall.

The individual ship would be cheaper, with fewer missiles, but the overall cost of the whole system would be more. The issue then became: Have you got enough baskets? With 24 missiles in each basket, you get a cheaper system for the given missile force on line with a larger number of missiles in each ship.

SIZE OF TRIDENT MISSILE

The second issue was and is: Do you need the bigger missile tube? That is an issue of whether we are or are not going to utilize the extra space per missile in the future. That is an argument your committee has been into. It is an argument that Naval Reactors has nothing to do with. You have to decide whether you want the flexibility for that larger missile tube in the future for whatever events face you.

You can put in a longer missile, more warheads for a given range, or put other devices in the missile tube, et cetera.

Mr. BENNETT. How much more per tube does that cost?

Mr. LEIGHTON. I don't have cost figures here. The size and number of tubes sets the size of the submarine. There are lots of studies made on this point. So far the people responsible for the missile program have held that they want the larger missile tube for future capability. The system analysts have held out for 24 missiles per submarine because the overall cost per missile is less.

If Congress were to say we are never going to build a missile larger than Trident I, then you don't need the larger missile tube.

Mr. BENNETT. Who makes that decision in the Department?

Mr. LEIGHTON. It goes all the way up to the Secretary of Defense.

Mr. BENNETT. So far they want the option?

Mr. LEIGHTON. Yes. The recommendation has been made by the Navy and the Department of Defense to the Congress to proceed with the capability of utilizing the larger missile tube for the future. It is an area Naval Reactors does not have expertise in.

Admiral RICKOVER. In your own favor, I would remind you that several years ago you raised this very question. The Navy looked into it for you and came up with this answer. You raised that issue a long time ago. I just wanted to refresh your memory.

Mr. BENNETT. It is always nice to be reminded about my past wisdom.

Admiral RICKOVER. My intuition is that we could do it cheaper. In the first place, look at that situation: One of the things that people claim about the Trident is that even while it is in port, its missiles have a range to reach their targets. You could reach targets from Puget Sound, for example.

So that raises some more questions. I believe the whole issue ought to be looked into. I certainly would have it looked into by a committee such as this. You may come out with a different answer.

Mr. HALE. Are you aware of Dr. Mann's testimony before the Research and Development Subcommittee this spring when the statement

was made that the Navy determined there is an affordability problem with the Trident II and possibly no requirement for Trident II?

Admiral RICKOVER. I am not. I have assiduously kept out of the missile business because I am not an expert in it. There is a group of people in the Navy, in the Strategic Systems Project Office, who are experts. I don't know enough about the missile itself. But I do know that they can carry a long-range missile in a smaller tube, which means you could have a smaller submarine. In fact the Navy is converting some existing submarines for Trident I missiles.

Mr. LEIGHTON. It is being done to 12 of the Poseidon submarines.

Admiral RICKOVER. The maximum speed of ballistic missile submarines is not very important. As important as for attack submarines.

Mr. FAZIO. The Soviets are doing that all the time, converting their attack submarines to missile carriers.

Admiral RICKOVER. No, sir. They are taking old missile submarines and making them into attack submarines. We can do the same.

So, I think what you want for future missile submarines is well worth looking into because you may save large sums of money. On the other hand, you may conclude that you need the larger missile tube for the future, and that the present Trident submarine design is most cost effective.

Mr. BENNETT. I will ask the powers that be in the Navy to give me this kind of information before we start marking up next year's bill. I don't believe we will have another hearing on it, but it is a good thing you raised, and I appreciate you doing it.

Are there any further questions in executive session?

CLOSING REMARKS

Admiral RICKOVER. I would like to make another point. I want to make sure that you and others understand that I am not just for spending money to build nuclear submarines.

Mr. BENNETT. Nobody ever suspected that you were. You are 100 percent American.

Admiral RICKOVER. Many people believe that I am a great advocate of submarines. My true feeling is that I would like to see them all sunk on both sides. I have said this to the President, too.

[Discussion off the record.]

Mr. BENNETT. Thank you, Admiral. We will try to make our next meeting on the 5th.

Admiral RICKOVER. I appreciate the way I have been treated by this committee. You have permitted me to talk the way I want to. You have taken no umbrage at the comments I have made to the members. I am very happy to testify to members of so open-minded, so objective, and so friendly a group of people.

Mr. BENNETT. We admire you in every respect.

Admiral RICKOVER. Not in every respect. If you do, you don't know me, sir.

Mr. BENNETT. The meeting will be adjourned.

[Whereupon, at 12:15 p.m. the subcommittee adjourned.]

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APPENDIX

ANALYSIS OF NUCLEAR ATTACK SUBMARINE DEVELOPMENT

H. G. RICKOVER

August 31, 1979

INTRODUCTION

This paper was prepared in response to several Congressional requests that I provide my comments on a recently completed study undertaken by the Navy to determine the feasibility of designing and building less expensive submarines. This study, called the "Submarine Alternatives Study", was initiated as a result of comments contained in the Senate Armed Services Committee Report on the Fiscal Year 1979 Defense Authorization Bill which stated the following:

> " The committee requests the Navy, in cooperation with the Office of the Secretary of Defense, to prepare and submit to the Congress no later than February 1, 1979, a comprehensive study and evaluation of all options and alternatives for maintaining an attack submarine force level of not less than 90 submarines. This study shall include evaluations of lower cost, lower capability nuclear propelled submarines and the use of nonnuclear submarines for some missions, in combination with submarines of the SSN-688 class. The question of the impact of various options on submarine building capacity should also be addressed."

It is my understanding that the report of the Submarine Alternative Study has been approved by the Secretary of the Navy but is still in final review by the Secretary of Defense. Copies of the report have been forwarded to the Congress.

The views expressed in this paper are my own and may not necessarily agree with those of the Department of the Navy or any other government agency. My views are based on information which is available to me,

over fifty years of knowledge and experience with submarines, and my intuitive feelings of the importance of submarines.

SUMMARY

The purpose of the study was to direct attention to options which offered the prospect of significantly reducing costs, while retaining operational adequacy. As stated in the "Plan of Attack" portion of the study, "the basic thrust of this study is the establishment of an approach that would lead to the identification of lower cost submarines with acceptable military capabilities." However, the problem of what kind of submarine to build is much broader than any choice between two or three specific submarine designs. The central issue is the almost complete lack of understanding in our military establishment of the value of the nuclear attack submarine in a modern Navy. This lack of understanding is especially disconcerting when one is aware of the obvious depth of understanding the Soviet Union has for the role of the nuclear attack submarine. The Soviets have demonstrated a longstanding commitment of a major portion of their national resources to the production of an ever increasing number of those highly capable ships.

The lessons of history demonstrate the wisdom of a commitment to submarines. Even the slow speed, diesel submarines had a devastating effect on the Allies in the two World Wars and on the Japanese in World War II. With the major advance in speed and endurance offered by nuclear power, the effect of the submarine will be greatly increased in any future maritime conflict.

Another fundamental lesson to be learned from history is that speed has always been a key element in naval warfare. Nuclear propulsion provides the potential for sustained submerged high speed capability which will give the submarine the tactical advantage needed to triumph in any future conflict. I have fought for years to make the Defense

Department understand this. I am not sure they ever will. As is demonstrated by the recent reportedly high speed operation of the ALFA Class submarine, the Soviets clearly understand the importance of speed and are building a fleet based on that understanding.

This Soviet submarine fleet is a rapidly increasing threat to our naval capability. The major role of the U.S. nuclear attack submarine is in countering the Soviet submarine force. Contrary to the popular belief espoused in the press and apparently held by some in the Defense Department who have an interest in spending money elsewhere, the U.S. anti-submarine warfare problem has not been solved. The continuing Soviet dedication to the increasing quantity and quality of their submarine force is making the anti-submarine warfare problem more difficult, not easier. There have been no breakthroughs which will solve this problem. Even if some means of reliably detecting Soviet submarines is developed, that will not mean that the submarine can be precisely located and killed. The single most effective weapon for detecting, localizing and killing the nuclear submarine has been and will continue to be the high speed, quiet, highly capable nuclear attack submarine.

In addition to being the most effective weapon against another submarine, the capability of the U.S. submarine to defeat the growing Soviet surface navy must also be recognized. With the recent introduction of the submarine launched HARPOON cruise missile and the impending introduction of the TOMAHAWK cruise missile to the U.S. attack submarine fleet, these submarines have become the only warship which can successfully penetrate into high threat areas to deliver anti-surface ship or land attack missiles as well as other submarine launched weapons. This increasingly important submarine capability must be factored into any analysis of the uses of the submarine.

The U.S., with the Congress taking the lead, has developed a highly capable submarine in the LOS ANGELES Class. But rather than take advantage of the capabilities of this ship, and improve on it, there are those in

the Defense Department who have set forth to demonstrate that this type of ship could be replaced in the future by a less capable submarine. This is evident in the current hodgepodge of attack submarine studies that have as their basic premise that the LOS ANGELES Class should not continue to be built because they are too costly. The Navy's Submarine Alternatives Study is just one of these studies. These studies demonstrate again the Defense Department disposition to produce voluminous expensive studies to support the pollyannish notion that cheaper is better.

The Navy can, of course, build smaller, cheaper submarines. However, it must be recognized that these would also be less capable submarines. They would not perform their missions as well as the LOS ANGELES Class and could not perform some missions at all.

Building smaller, less capable submarines would, in my opinion, be a grave mistake. In fact, the Submarine Alternatives Study, even with its basic thrust to establish that cheaper submarines are adequate, shows that the LOS ANGELES type submarine is the most cost-effective of all the options considered for realistic wartime situations. Particularly in a time such as the present, when the Navy seems to be constrained to build so few attack submarines, we cannot afford to further hamper the effectiveness of our submarine force by also making these ships less capable. We cannot afford to go backward while our potential adversary is so obviously advancing rapidly. We should continue to build the LOS ANGELES Class. We should continue our research efforts and incorporate the available improvements into future generations of the LOS ANGELES.

HISTORICAL DEVELOPMENT AND IMPORTANCE OF THE SUBMARINE

The following discussion provides my broad perspective on the lessons of history, the development of the nuclear attack submarine, the Submarine Alternative Study and the future direction of attack submarine development.

As is so often the case and is so frequently forgotten by the Defense Department, the lessons of history are our best teacher. In order to understand the importance of the nuclear attack submarine and its potential impact on naval warfare, one must first understand the development of the submarine and its historical importance to the U.S. and to other countries.

U.S. submarine history began with the TURTLE in 1776. Although this single man submarine did not succeed in sinking a vessel it did lead the way for others to follow. The first submarine to sink a warship was the H.L. HUNLEY. Although of an unstable design which had a habit of foundering and drowning her crews, this muscle powered ship did finally sink the U.S. steam sloop HOUSATONIC in 1864 but was herself sunk in the process.

Two basic technological deficiencies, the inability to propel an explosive charge to a safe distance from the ship and the inability to propel the ship submerged, severely limited the development of the submarine as a naval weapon. The invention of the self-propelled Whitehead torpedo in 1866 solved the first problem. The second problem, that of providing submerged propulsion, stymied submarine development for many years. It took the initiative and perseverance of one individual to bring the U.S. Navy into the submarine era.

John Philip Holland came to the U.S. from Ireland in 1873 and first submitted plans to the Navy for construction of a submarine in 1875. While in Ireland, Holland had apparently heard about the battle between the MONITOR and MERRIMAC in 1862 and noted that warships could be built to be semi-submerged with very little of their volume above water level. This thought of having a ship which could be almost totally submerged and fight successfully probably took him to the idea of a ship which was totally submerged and therefore never seen by the opposing ship. Through his own efforts, Holland designed and obtained private financing to build his early submarines. His efforts were successful in

that he designed and built a submarine which was capable of functioning under the water and attacking ships. But he was not initially successful in having the U.S. Navy accept the concept of a submarine. During Holland's initial submarine development period, the Navy almost totally rejected the notion that a submarine could become a factor in naval operation. It was not until after the Spanish had tested a submarine in 1889 that the U.S. Navy decided it might need one. Even after this decision, the Navy drew up specifications which were technically naive and impossible to attain. Disgusted and discouraged by the Navy's blindness, Holland decided once again to build a submarine financed by private money. His solution to the problem of submerged propulsion was to use a dual system -- a gasoline engine for surface propulsion and storage batteries and an electric motor for submerged propulsion. Holland's submarine was built and then sold to the Navy as an accomplished fact. This first U.S. submarine was commissioned on October 12, 1900.

GERMAN WORLD WAR I SUBMARINE SUCCESS

It was the Germans who first demonstrated the importance of the submarine in naval warfare. The German submarines of World War I could operate to a maximum depth of 250 feet, could make only 8 knots submerged and could remain at sea for only 30 days. Since this included the transit time to and from the patrol area, they actually had only about 15 days on station. Yet in 1916 and 1917, the worst years of the submarine war in World War I, with an average of only 47 German U-boats at sea, the Germans sank about 400,000 tons of shipping per month. In a single month, April 1917, German U-boats sank ships totaling more than 850,000 tons, most of which were attempting to supply the British Isles. During all of World War I, the German submarines sank over 5,600 Allied ships totaling almost 15 million tons.

These figures demonstrate the effectiveness of the German submarines in World War I. However, the German decision to use these submarines to

wage unlimited submarine warfare is interesting not only because of its recognition of the importance of submarines but also because it demonstrates the pitfalls of taking action based on optimistic analysis instead of heeding the prudent judgment of experienced men. In this case, the analyses developed by German decision makers proved that the fighting could quickly be ended by conducting an unlimited submarine campaign because the lack of food and other supplies would cause England to sue for peace.

As is often true of their modern counterparts, the German systems analysts of World War I made the fatal mistake of making a decision based on an expectation which was treated as if it were a certainty. This German decision to conduct unlimited submarine warfare was based entirely on the analysts' prediction that the British would be forced to sue for peace within 5 months. Their prediction of the tonnage the German submarines could sink proved remarkably accurate. However, the analysts did not count on the determination of the British people and the success of Allied convoy tactics which eventually took away the basic foundation of the German strategy. That fateful submarine decision, therefore, failed to achieve the goals it was designed for; it succeeded only in galvanizing American opinion in favor of intervention on behalf of the Allies, and led to Germany's defeat.

WORLD WAR II -- SUBMARINE BATTLES IN BOTH OCEANS

The Germans again demonstrated the importance of the submarine in World War II. Here is what Soviet Admiral of the Fleet Gorshkov has said about submarine warfare in World War II and its implications for a war in which nuclear submarines are used:

> "For each German U-boat, there were 25 British and U.S. warships and 100 aircraft, and for every German submariner at sea there were 100 British and American anti-submariners. Yet, nevertheless, this

significant numerical superiority of defenders was insufficient to force the attackers to fully curtail their active operation. Therefore the question of the ratio of submarines to anti-submarine forces is of great interest even under present-day conditions, since, if ASW forces, which were so numerous and technically up to date for that time, possessing a vast superiority, turned out to be capable of only partially limiting the operations of diesel submarines, then what must this superiority be today to counter nuclear submarines, whose combat capabilities cannot be compared with the capabilities of World War II-era submarines."

The Battle of the Atlantic during World War II was essentially a battle to regain control of that ocean from German submarines. The German U-boats inflicted devastating losses in the early years of the war, including over 4 million tons of shipping sunk in 1940 and in 1941, over 8 million tons in 1942, and over 23 million tons total during the war. The German submarines were finally defeated by the ability of the Allies to break the German communications code, thereby learning the general location of German submarines, and by the ability to use new technological developments in radar and sonar to detect, track, and sink those submarines. The technological success we had in World War II may be one of the main reasons that the present Soviet submarine threat is not considered as grave as it should be. But to presume that we will again be able to break the enemy code or discover some other new means of detecting submarines is a road to disaster.

The submarine was also a major factor in the Allied victory in the Battle of the Pacific. In this situation, however, it was the U.S. submarine force which effectively cut the Japanese home islands off from both their vital sources of raw materials and from their far flung military operations which required logistic support. Fleet Admiral Ernest J. King, Commander in Chief, United States Fleet, in his official report to the Secretary of the Navy at the end of World War II stated:

"Submarine warfare was an important factor in the defeat of the Japanese... Our submarines are credited with almost two-thirds of the total tonnage of Japanese merchant marine losses or a greater part than all other forces, surface and air, Army and Navy combined. Of the total number of naval vessels sunk, our submarines are credited with almost one-third."

As identified by Admiral Gorshkov, the importance of submarines in both World Wars is only a precursor to the impact this vessel will have due to the application of nuclear power. Before the first nuclear submarine became a fact, the submarine was at best a hybrid. It was, in simple reality, a small surface ship that could submerge for very short periods of time. In 1950, the time the submarine could spend submerged and its speed below the surface were not much greater than those of submarines used 30 years earlier. The dual propulsion sysytem first utilized by John Holland, with internal combustion engines for surface propulsion and electric batteries and motors for submerged propulsion, were still the principal means of submarine propulsion.

THE NUCLEAR SUBMARINE

The nuclear reactor eliminated the internal combustion engines, the need for a large amount of space to store oil, and the necessity for surfacing to recharge batteries. The reactor of a nuclear submarine provides heat for the generation of steam. This steam drives the turbines to propel the ship and drives the turbine generators to provide electric power for the ship. The electric power produced runs oxygen generators for the crew while the submarine is submerged. There is no step in this process which requires the presence of outside air or oxygen. This fact alone allows the ship to operate completely independent from the earth's atmoshpere for extended periods of time.

Bringing the Navy into the nuclear age has not been easy. From its inception, the application of nuclear power to warships has faced strong

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and persistent opposition from many elements of the Navy and the Defense Department. Among the reasons for this opposition were: (1) a belief that nuclear power would never work; (2) a basic resistance to change so characteristic to the Navy; (3) a fear of upsetting longstanding theories on naval warfare, and; (4) a belief it was better to have more ships that cost less even though the nuclear powered ships could defeat any conventionally powered counterpart. The development of the first nuclear powered submarine, the NAUTILUS, would never have occurred if Congress had not insisted on its development and the Atomic Energy Commission had not been willing to undertake development of the reactor plant and the prototype propulsion plant. In fact, the AEC provided the funds for the reactor plant installed in the NAUTILUS.

Just as there had been opposition to nuclear propulsion in warships, there has been resistance to using the full capability of nuclear power to increase the military potential of these ships. Proving again that the most obvious developments can be obscured by the weight of established thought, the Navy's leadership, rather than seizing upon this revolutionary technology and allowing it to free them from old constraints, tried to cut the technology back to fit their preconceived ideas of submarine warfare.

Following the successful operation of the NAUTILUS prototype but more than a year prior to the NAUTILUS going to sea, the Navy decided to build additional nuclear submarines. At that time the feeling among the submariners was that the NAUTILUS was too large, that we should not build submarines any larger than the TANG class post World War II diesel boat, and that there was no operational requirement for a top speed above that which a diesel boat had. Not ever having had a submarine with a higher top speed, the submariners simply could not visualize the importance of high speed in a nuclear submarine. As a result, the Chief of Naval Operations requested that I undertake the development of the

propulsion plant for the SKATE Class attack submarines with the speed about that of a diesel submarine.

However, I was convinced that once the NAUTILUS was at sea the submarine community would recognize the significance of the high speed capability which nuclear power could provide for attack submarines. I therefore started development of a reactor plant that would give a higher speed capability again using AEC funds. Because of this early start in the development of this plant, designated the S5W reactor plant, the Navy was able to program the lead ship of the SKIPJACK class of fast attack submarines in the FY 1956 program. The SKIPJACK, which incorporated a new streamlined hull design and the S5W reactor plant, became the fastest submarine in the U.S. fleet. The S5W reactor plant became the standard propulsion plant for most of our current attack and all of our POLARIS submarines. Again, it must be remembered that it was not the Defense Department that was responsible for the development of the S5W plant. It was done with the approval of the Congress and with the backing of the Atomic Energy Commission.

Very early in the development of naval nuclear propulsion, I recognized that the potential for sustained high speed could be used to expand the role of the attack submarine beyond the traditional anti-shipping and anti-submarine missions. With virtually unlimited high speed endurance I felt they could provide a superior form of protection for our high value surface combatants. This idea had been almost completely ignored because it was so contrary to prevailing naval doctrine and because the advocates of surface ships and aircraft realized it might diminish the importance of surface escorts. Some recognition of this idea was given in the development of the USS TRITON (SSN586) which was put into service in 1959 as a radar picket submarine. The idea was that this ship would sail in advance of a task group and surface to perform a radar search. However, the three-dimensional air search radar required for this mission was never developed for submarine use. TRITON was essentially never

used in its original role and was used instead for more traditional submarine missions. Her submerged circumnavigation of the world in 1960 provided a dramatic demonstration of the potential of nuclear propulsion.

Another program which gave the nuclear submarine a potential for serving in an escort role was the REGULUS cruise missile program. This missile was installed in the USS HALIBUT (SSN587). Although the missile was principally a strategic weapon, it had the potential for being used to attack enemy surface ships either alone or in conjunction with a surface task force. However, the POLARIS strategic missile program soon made the REGULUS obsolete as a strategic weapon. Its potential for use against enemy surface ships was never exploited and the Navy dropped the REGULUS program. The HALIBUT was converted for other missions.

The S5W reactor plant first used in the SKIPJACK continued to be the mainstay of our nuclear attack submarine fleet. It was used in the larger, more sophisticated PERMIT class and STURGEON class attack submarines. However, a troublesome aspect of this approach is that as each of these classes of ships subsequent to SKIPJACK grew larger and heavier to accommodate advances in military capability, they became a little slower. This loss of speed capability is significant in submarine warfare.

THE ROLE OF SPEED IN NAVAL WARFARE

Speed has always been a key, though frequently unrecognized, element in naval warfare. From the swift liburnian galleys used by the Romans to dominate the Mediterranean for over four centuries to the sleek Baltimore clippers used by U.S. blockade runners during the War of 1812, early maritime history is replete with examples of the advantages of superior speed in naval warfare.

In spite of this history, the leaders of the world's navies, bound by their traditions and the comforts afforded by that which is familiar,

have frequently refused to recognize and accept the advantages of speed offered to them by technological advances. It took years of dogged determination by the Navy's Engineer-in-Chief, Benjamin Franklin Isherwood to drag the Navy from the age of sail to the full realization of the potential of the age of coal. When finally completed in 1868, Isherwood's coal powered cruiser, the MANHANOAG, achieved the record speed of 17-3/4 knots and could catch any ship she wanted to fight or could escape from any ship that outgunned her. Her demonstrated capability revolutionized naval warfare. Yet, rather than rewarding Isherwood for his accomplishment, the Navy's unrestricted line officers were intensely resentful of the rising importance of steam engineering and the resultant decline in the importance of the general line officer whose expertise was in the use of sail. They succeeded in removing Isherwood from his office as Engineer-in-Chief and destroyed the speed capability of the MANHANOAG by removing half her boilers in order to add more sail. So far did they set the Navy back that the 17-3/4 knot speed of the MANHANOAG would not again be attained by a U.S. Navy ship until 1889, 21 years later.

In a later period, there was great reluctance to shift from coal-fired to oil-fired boilers in warships. At the beginning of the 20th Century, it was accepted generally that oil-fired warships offered great military advantages over coal-fired warships, but they were more expensive. It took Sir Winston Churchill's command decision as First Sea Lord to give Britain's Royal Navy the position of world leadership in converting warships from coal to oil. As it later turned out, this was a significant factor in Britain's naval superiority in World War I. The British Admiralty had built oil-burning destroyers as early as 1908, but, as Churchill is quoted as saying at the time:

> "Shocked at the expense, (the Admiralty had) reverted for 2 years to 27-knot coal-burning flotillas. I was too late to stop the last bevy of these inferior vessels, but I gave directions to design the new flotilla to realize 35-knot speed without giving up

anything in gunpower, torpedoes, or seaworthiness. I proposed to the board that if money ran short,we should take 16 of these rather than 20 of the others. Building slow destroyers! One might as well breed slow racehorses."

At about the same time in the U.S., Lieutenant Commander (later Rear Admiral) William S. Sims produced a report to President Theodore Roosevelt which was to swing the course of American battleship construction toward large, fast, big-gun ships. A key element of Sims' argument was his analysis of the resounding defeat of the Russians by the Japanese in the 1905 Battle of Tsushima Straits during the Russo-Japanese War. Sims noted that the six knot speed advantage of the Japanese fleet enabled Admiral Togo, the Japanese commander, to carefully prepare the disposition of his forces in approaching the enemy in order to bring the slower Russian fleet to action at the time and circumstances which suited him. This speed advantage also allowed the Japanese commander to choose the range of the engagement to best suit his own gunpower and to cut off the Russian fleet's escape to Vladivostok.

Thus the value of high speed became firmly established for naval surface forces. For the diesel submarines of World Wars I and II, however, there was really little option. Their dependence on batteries while submerged assured that whatever speed capability they did have could not last long. Their surfaced speed was limited to less than 20 knots by the size and weight of the diesel engine. There are many historical accounts documenting World War II submarine actions where important targets escaped submarine attack, often unknowingly, because of the lack of speed of the diesel submarine.

TACTICAL ADVANTAGES OF HIGH SPEED IN NUCLEAR SUBMARINES

The application of nuclear propulsion to submarines not only created the first true submarine, able to operate for essentially unlimited

periods of time submerged, but also provided the submarine with the significant potential to achieve high sustained speeds.

This improved speed capability provides a number of tactical advantages over slower ships. This advantage can be used to sprint ahead of a target to gain an advantageous tactical position or to increase the amount of time spent listening at slow speeds when using the sprint-drift search tactic. A high speed submarine can catch a high speed target detected at long ranges. It can maneuver to evade torpedoes or clear the area rapidly after firing a weapon or otherwise revealing its position. High speed can be used to reduce transit times in responding to urgent requirements anywhere in the world. This high speed capability can also be used to recover from the miscalculations, errors in judgment, or incorrect choices of tactics which are an inevitable result of the uncertainties of submarine warfare and which may have placed the ship in danger of enemy attack or caused the ship to lose its tactical advantage.

In the various missions which an attack submarine must perform, these tactical advantages can be used to affect the outcome of the mission. The high speed capability can be used to provide direct support to high speed surface task forces. High speed is essential in this mission in order to search well forward of the task force, to provide early detection and warning to the task force of an enemy submarine threat, to gain an early advantage in prosecuting and attacking the targets, and to regain position ahead of the task force after prosecuting an attack or after a task force course change.

High speed is essential when attempting to intercept enemy submarines or surface ships which have been detected by other surveillance means at long ranges from the U.S. submarine. The high speed capability means that a submarine will be able to overtake a fast target and that the size of the area to be searched upon reaching the reported target position will be smaller. High speed capability would also be essential in maintaining surveillance on Soviet high speed submarines.

In attempting to attack a widely scattered high speed surface task force, high speed capability would allow a submarine to obtain the best position for attack, to evade counterattacks, and to reattack the remaining units even if they attempt to escape at high speed.

The architect and builder of the modern Soviet Navy, Admiral of the Fleet Gorshkov, clearly has a full understanding of the lessons of history in this regard. In his book, Sea Power of the State, Admiral Gorshkov states:

> "Scientific-technical progress is leading to the development of increasingly more mobile platforms and long-range high-speed weapons systems. Therefore, in the future speed will become an indispensable characteristic of any operation, battle, and strike....
>
> "It is precisely the speed of various groupings of forces directed toward the most important enemy objectives which will become the deciding factor in selecting their operating methods. Speed ensures a more complete utilization of every combat capability of the forces in order to rapidly achieve operational goals and make their attacks overwhelming and irresistible....
>
> "The importance of speed, this most important factor in naval warfare, will grow, and the ability to conduct swift actions will become the most important indication of a mastery of the art of naval warfare."

SOVIET NUCLEAR ATTACK SUBMARINE BUILDUP

Admiral Gorshkov has utilized these sound principles in developing the current Soviet nuclear submarine fleet. The importance of the submarine has long been recognized in the Soviet Navy. Since the late 1930s', the Soviet Navy has had more undersea craft than any other navy.

The building of the formidable Soviet nuclear attack submarine force became evident when the lead unit of the NOVEMBER Class attack submarine first went to sea in 1959. Although early ships of this class did not appear to be reliable, the problems were apparently corrected and fourteen NOVEMBER class submarines were eventually built through 1965. In 1968, the first of the over 30 knot VICTOR class attack submarines entered service. This submarine incorporated major improvements in various characteristics as compared to the earlier NOVEMBER's. Further improvements have apparently been incorporated as later ships of this class have been reported as slightly larger.

In 1971, three years after the first VICTOR went to sea, the first of the highly publicized ALFA class attack submarine went to sea. This submarine has emerged as an excellent example of the resources the Soviets are willing to expend to develop an attack submarine force which has a combat capability second to none.

The ALFA was generally considered to be a failure. Yet, further construction continued and additional units have been launched.

In building this class, the Soviets have made a major commitment of their national resources to a program which has apparently encountered severe development problems. During the period in which the Soviets were attempting to solve these development problems, they produced more than thirty-five ships of the existing submarine classes which were under construction in 1969 and in addition developed at least four new classes of nuclear submarines, at least one new class of diesel submarines, and at least two nuclear submarine conversion programs. In the last ten years they have introduced more new submarine designs than have ever been put to sea during a comparable period in all of naval history. This has truly been an impressive feat.

In addition to the attack submarine program, the Soviets have also built an impressive nuclear powered anti-surface ship cruise missile

firing submarine fleet. Since these submarines also have a significant anti-submarine warfare capability, I will include them in this discussion. The 29 ECHO II class submarines are of the same generation as the NOVEMBER class SSN's and are equipped with eight surface launched anti-surface ship cruise missiles. These ships are reportedly being modernized to fire a new, longer range, more sophisticated missile. The earlier ECHO I's have been converted to attack submarines with improvements over the NOVEMBER class.

The second generation Soviet cruise missile firing nuclear submarine, the CHARLIE I, was introduced into the fleet along with the VICTOR SSN's in 1968. Like the VICTOR it incorporated significant improvements. The eleven CHARLIE I's each carry eight submerged launched anti-surface ship cruise missiles and anti-submarine weapons. The three most recent submarines of this type, the CHARLIE II's, have been increased in size. A third type of Soviet cruise missile firing nuclear submarine, the PAPA, first appeared at sea in 1971.

Thus the Soviet fleet of nuclear powered attack submarines is continuing to grow in both quantity and quality. They presently have 90 nuclear powered attack and cruise missile submarines as compared to our 74. The Soviets are continuing to build nuclear powered attack submarines at a rate of about four per year. In addition, recent evidence indicates that two YANKEE Class submarines are no longer SSBN capable.

COMPARISON OF U.S. AND SOVIET NUCLEAR ATTACK SUBMARINES

However, a simple count of the numbers of Soviet submarines, while impressive, is not sufficient to understand the importance the Soviets have placed on attack submarines. We also need to understand something of the combat capabilities of the Soviet fleet as compared to the U.S. A brief comparison shows the considerable effort the Soviets have devoted

to attaining highly capable attack submarine fleet they presently possess and the tenuous nature of our present qualitative lead over the Soviets in some areas.

I have discussed the importance of speed in a submarine. The estimated speed of Soviet SSN's has been rising steadily while that of the U.S. SSN's was dropping until the LOS ANGELES Class. In fact, the Soviets presently have a large number of nuclear attack submarines with top speeds greater than that of our SSN's. The new deep running, fast nuclear attack submarine, ALFA gives further evidence that the Soviets are determined to continue to build a submarine fleet which will have a high speed capability.

With the introduction of the LOS ANGELES class submarine in 1976 the U.S. has finally begun to adequately address the issue of the high speed of the Soviet vessels.

One area in which the U.S. has worked for an advantage over the Soviets is in radiated noise levels. It would appear that this would be an area in which the Soviets would concentrate their efforts in the future. Their second generation nuclear attack submarines (VICTOR and CHARLIE), which first went to sea in 1968, are quieter than the first generation (ECHO and NOVEMBER).

The U.S. embarked on a major submarine silencing program many years ago. The Soviets apparently have yet to incorporate into their nuclear submarines those features which will make major improvements in radiated noise. It should be expected that they will make major improvements in the future generations of attack submarines.

In the area of depth capability, most Soviet submarines have been assessed to have a deep operating capability. Now with the reported deeper operating depth of the ALFA, the Soviets have demonstrated they have a submarine which can dive deep to gain a tactical advantage.

The Soviets have the largest and most modern submarine yards in the world. They are credited with a nuclear submarine production capability of 20 nuclear submarines per year operating on a single shift basis. While not fully utilizing this vast building capacity, they have since 1974 completed 40 submarines. As late as 1966, the Russians had only two new construction yards for building nuclear submarines; today they have four with this capability, and further expansion of such facilities is currently in progress. At present, the maximum U.S. capacity to build nuclear submarines is less than half that of the Soviets. Even without any increase in building rate the Soviets can be expected to at least continue the present construction rate of about six - eight submarines a year. Another source of attack submarines would be for the Soviets to comply with SALT agreements by converting older YANKEE class SSBN's to SSN's when new SSBN's are built.

GENESIS OF THE LOS ANGELES CLASS

While the Soviets were building a nuclear submarine fleet based on Admiral Gorshkov's understanding of the importance of high speed, official U.S. estimates in the early 1960's credited Soviet nuclear submarines only a 20 to 22 knot maximum capability. I knew these estimates were probably low. Recognizing the Soviet potential for building high speed submarines and the loss in speed capability the U.S. had suffered, as our submarines got larger, I initiated a study of a new high speed submarine in the spring of 1964. Later that year I convinced the Director of the Submarine Warfare Division in the office of the Chief of Naval Operations to establish a formal study of the high speed submarine which ultimately became the LOS ANGELES Class. At my urging the primary mission of this ship was to be an escort for surface forces including attack carrier task forces. It would also be able to perform anti-ship and anti-submarine warfare missions. The project was thus called the Fast Escort Submarine.

This study proceeded and work began on the design of the propulsion plant to be used for this submarine. The Fast Escort Submarine project ran into the same old objections within the Navy that had surfaced before whenever I had suggested submarines could escort surface ships. As a result of great pressure brought to bear on the Chief of Naval Operations by the surface warfare officers, the CNO in the fall of 1966 renamed the Fast Escort Submarine, the High Speed Nuclear Attack Submarine. Its mission as a surface ship escort was deleted from the ship characteristics and it was cast in the standard submarine roles. This of course was largely a change in terms and did not alter ship design or the ultimate use of the ship, but it is indicative of how strongly entrenched the traditional power structure was in the Navy.

Over the next year there was considerable internal Navy debate, proposal and counter proposal, as to what characteristics the High Speed Nuclear Attack Submarine should have. Input from the Fleet Commanders was obtained and a definite ship began to emerge. In March of 1967 -- three years after I started development of the propulsion plant with Atomic Energy Commission funds -- the Navy first requested research and development money for the High Speed Submarine. This put the matter before the Defense Department. I met with the Director of Defense Research and Engineering (DDR&E) in June of 1967 and he agreed with the need for a high speed submarine and that he would give it immediate attention. What I did not know at the time was that his involvement in the design of the ship would result in using studies and administrative maneuvering to delay a decision to proceed with the ship for over a year.

One of the important items in recognizing how the SSN688 Class ultimately came to be, is to realize what the Soviets were doing at the time and what the overall U.S. submarine program was slated to be. In 1964, when I first began work on the High Speed Submarine propulsion plant, the Soviet submarine program was growing but at a measured pace.

They had introduced a first generation of nuclear powered attack, cruise missile and ballistic missile submarines. Their force was predominantly made up of post World War II diesel submarines. They had about a three to one advantage in overall numbers even though we led them in numbers of nuclear powered units.

Over the next several years the Soviet nuclear submarine building program accelerated. They invested heavily in new construction facilities and have reached the stage where they have the largest, most modern submarine building yards in the world. Their at-sea deployments increased and they began building an entirely new generation of attack, cruise missile and ballistic missile submarines with advanced characteristics and weapons. Of particular importance was the evidence that became available to us that Soviet nuclear submarines were capable of high speeds.

Despite some very strong evidence, the Defense Department continued to rate Soviet nuclear submarines with a limited speed capability. They used this along with many other optimistic assumptions in studies of theoretical wartime scenarios. The Defense Department studies concluded that, with our latest nuclear submarines, the U.S. could achieve a 25 to 1 kill ratio over Soviet submarines. While such results were incredible to our submarine community and based on entirely unrealistic assumptions, they were used as a basis for the Secretary of Defense to direct, in 1967, the termination of the nuclear submarine building program in FY 1971. This would have frozen the U.S. nuclear attack submarine force level at 64 submarines of which nine were older, less capable units. The Chief of Naval Operations position at that time was that, in view of the increasing Soviet threat and in order to meet U.S. mission requirements, the Navy should have from 100 to 120 first line nuclear submarines.

It was in this environment that attempts were being made to get the High Speed Submarine moving. As mentioned earlier, it took over a year

to get the Director of Defense Research and Engineering (DDR&E) and ultimately the Secretary of Defense to proceed. We went through nine different drafts of the Development Concept Papers which were then required by the Defense Department to initiate any major new development. These various drafts proposed all manner of unacceptable technical developments and plans which would have delayed the ship. The first breakthrough came in February 1968 when DDR&E finally agreed to release a small amount of research and development funds for the High Speed Submarine.

CONGRESS FORCES LOS ANGELES CLASS AUTHORIZATION

At about that time Senator Stennis, Chairman of the Preparedness Investigating Subcommittee of the Senate Armed Services Committee, began an investigation into the Defense Department plan to stop nuclear submarine production and the lack of progress on proceeding with the High Speed Submarine. A special Subcommittee on Anti-Submarine Warfare of the House Armed Services Committee was also formed to look into the submarine program. Both committees held hearings as did the Joint Committee on Atomic Energy. The conclusion of all three Committees was that the United States required a strong on-going nuclear attack submarine construction program and that we should proceed with the High Speed Submarine on an urgent basis. Reports by all three committees were issued to that effect. To back this up Congress added money to the FY 69 Defense Authorization Bill for long lead time components for the first High Speed Submarine that would enable the first ship to be fully funded in the FY 70 budget.

In view of this Congressional pressure the Defense Department finally capitulated. On July 1, 1968 the Secretary of Defense approved proceeding with a High Speed Submarine program and thereby a continuing U.S. nuclear attack submarine progarm. Even with this action there has been continuing reluctance on the part of the Defense Department to

request adequate numbers of these ships. In almost every year since funds were first authorized, Congress has either added or attempted to add LOS ANGELES Class submarines to the Defense Department's shipbuilding proposal. The result to date is a total of 34 LOS ANGELES Class submarines authorized through FY 80.

LOS ANGELES CLASS EFFECTIVE IN ACTUAL OPERATIONS

The wisdom of the Congress' decision to force development of the LOS ANGELES Class has been shown in a number of exercises, tactical development programs, and actual operating experiences in which the LOS ANGELES Class submarine has been involved. These situations again demonstrate the effectiveness of a modern high speed submarine when used against both submarine and surface targets.

In March 1977, the USS LOS ANGELES (SSN688) completed the first in a series of exercises designed to determine the tactical capability of the LOS ANGELES Class. This was an eight day exercise in which the LOS ANGELES and a STURGEON Class submarine, the USS SEA DEVIL (SSN664), were acting as anti-submarine escorts patrolling ahead of a simulated high speed surface task force crossing the North Atlantic. Two other STURGEON Class submarines simulated enemy submarines. The exercise results indicate that LOS ANGELES was superior in ability to detect the enemy submarine. It was noted during the exercise that, although the performance of LOS ANGELES exceeded that of SEA DEVIL at all task force speeds, the superior performance of LOS ANGELES was especially apparent at high speeds.

Although it is apparent that her sonar, fire control system, and speed improvements all contributed to the success of LOS ANGELES in this exercise, the exercise results clearly show that the LOS ANGELES' speed capability was a major factor in her superior performance. This high speed capability not only increases the effectiveness of the submarine,

it also increases the effectiveness of the entire task force since it gives the task force commander the option of using greater overall task force speeds without increasing the risk of attack from enemy submarines.

Two other exercises have shown direct comparisons of the performance of STURGEON and LOS ANGELES Class submarines in various situations. One exercise in 1978 involved a search for a quiet diesel submarine. The higher speed of the LOS ANGELES Class provided the ship with tactical options for active search that were not attainable by the previous STURGEON Class submarines.

In another exercise, both a STURGEON Class and a LOS ANGELES Class were assigned the function of defending against an enemy submarine. The LOS ANGELES Class demonstrated superior ability to conduct a more efficient search and detect more submarines faster and at a longer range. The combination of the higher speed and improved sonar again demonstrated the LOS ANGELES to be a superior class of attack submarine.

DOD DOES NOT UNDERSTAND THE IMPORTANCE OF SUBMARINES IN ASW

These exercises have proven the superior capability of the high speed LOS ANGELES Class submarine in an anti-submarine warfare role. Countless other exercises and missions have demonstrated that nuclear attack submarines are superior to all other weapons systems in ASW. Clearly, the rapid building of the formidable Soviet nuclear submarine fleet shows that the need for ASW capability is increasing. Yet, the Defense Department has continued its steadfast refusal to recognize the nature of the Soviet submarine threat or to acknowledge the increasing importance to the U.S. of the high speed attack submarine in combatting this threat. Moreover, there appears to be a currently developing attitude on the part of certain people in the Defense Department and elsewhere that there is no longer an ASW problem. These people seem to feel that there have been recent advances in U.S. ASW technology that has made the Soviet submarine threat go away.

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I know of no breakthroughs in the technology of anti-submarine warfare or in any other situation which has made the Soviet submarine threat disappear or decrease in any significant manner. While there have been improvements in some technology, these advances have not overcome the increasing numbers of advanced Soviet nuclear powered submarines I have previously discussed.

In spite of this fact, however, there have been press stories to the effect that underwater listening devices, such as the much publicized SOSUS system, have solved the submarine problem. This simply is not true and will not be true for the forseeable future.

There is also prevalent in some corners of the Pentagon the thought that U.S. surface ships are now capable of solving the ASW problem because of recent improvements in submarine detection capabilities. However, while these improvements are useful, I am not aware of any exercises that demonstrate they have completely solved the ASW problem.

In an exercise called PASSEX 1-79 conducted in March 1979, a LOS ANGELES Class submarine was pitted against a non-nuclear aircraft carrier task force which was transiting the Atlantic. This exercise approximated actual operating conditions. The LOS ANGELES Class submarine demonstrated the advantages of her high speed in conducting a high speed approach and launching an undetected attack on the task force.

In a recent exercise, MULTIPLEX 4-79, the USS LOS ANGELES and two other nuclear submarines attacked a task group centered around the conventional aircraft carrier, USS RANGER. During this exercise, LOS ANGELES frequently used her high speed capability to maintain contact with the surface task group, even at task force speeds which caused the other nuclear submarines to fall behind and lose contact. The LOS ANGELES successfully launched numerous attacks against the RANGER and her supporting ships.

These exercises graphically illustrate that those Defense Department system analysts who only fight wars on paper, do not realize the true nature of the ASW problem or the need for the attack submarine to combat the problem.

SYSTEMS ANALYSIS -- WITCH DOCTORS, SUPERSTITION, AND OTHER MAGIC

Systems analysts have long been using these paper wars to prove their preconceived positions. Their position has generally been that cheaper is better. I cannot recall any period of time in the last 25 years when one or more groups in the civilian hierarchy of both the Defense Department and the Navy Department or in one of their associated "think tanks" hasn't been attempting to find the ultimate in a bargain basement submarine. The motivations and circumstances surrounding their studies have varied but the objectives are usually the same - they either want a cheap submarine for a single purpose or they want a smaller, lighter, cheaper submarine which will provide the same or improved capability. The proponents of these studies apparently fall into one of two categories -- these proponents either intend to dictate the rules of the next war such that the enemy will always use the tactics the single purpose submarine is designed to combat or they believe in magic. They initiate study after useless study which succeed only in diverting the attention of those of us who have the responsibility to design, build and operate the nuclear submarines our fleet requires. They issue their reports, make their recommendations, move on to other jobs, and leave the rest of us to live with the results of their efforts.

The worst practitioners of these methods came upon us when Mr. McNamara was Secretary of Defense. He started this whole systems analysis syndrome in the Defense Department. After a while, each of the services established its own systems analysis group to protect itself from the Defense Department analysts. That situation still exists. Now it seems that everybody has his own group of captive systems analysts.

What bothers me is that in systems analysis, our society has been offered a supposedly new form of salvation through quantification. Those who work on these problems of quantification have now been accorded a status in our society analogous to that of the witch doctor in primitive cultures. Like the witch doctor, systems analysts have operated with one part expertise and nine parts mumbo jumbo, and for years they have found a happy and profitable home in the Pentagon.

Systems analysts have both encouraged and benefited from a widespread acceptance of the dogma that any information which is tabulated becomes, thereby, scientific. This is one of the most outrageous superstitions of our time. Yet, it finds fruit in a peculiar human notion which supposes a greater degree of order and regularity in things than really exists.

The tools of systems analysis are computers, game theory, and simulation models. When used with circumspection, a computer can render many beneficial services. But the analysts' adulation of this wondrous gadget makes them number maniacs, and contributes to the illusion that the kinds of data which can be quantified and processed by a computer must be more important than those data which cannot be measured. This illusion increases the likelihood of bad decisions, which most often occur not because of faulty deductions, but because of unexamined false premises.

Within the military, systems analysis makes great use of simulated war games and models. The value of simulation games is that they can help to give beginners some idea of the intricacies of a situation. But they cannot supply deeper insights to experts, because games cannot reproduce all of the many factors involved in a real situation. Those factors which cannot be included in the simulation, such as equipment failures, human reactions, decisions or errors, and complex tactical situations, often determine the outcome in a real-life contest. As aids

to decision making, simulation methods suffer from a fundamental weakness: they tend to focus attention on optimizing something within initial assumptions rather than examining the assumptions. Thus, as in the case of the German decision to initiate unrestricted submarine warfare during World War I, the biggest errors are usually committed through acting upon assumptions which are not adequately questioned or evaluated. In practice, simulation models which go beyond the simple mechanical situations appear impressive but are in fact divorced from reality.

SENATE REQUEST FOR STUDY OF SUBMARINE ALTERNATIVES

It was with this systems analysis atmosphere pervading the Pentagon, that the Senate Armed Services Committee requested the current analysis of alternative attack submarines. This was, of course, a reasonable request on the part of the Committee, which is concerned with the cost of submarines and wishes to make certain that the taxpayers money is being wisely spent. However, the response to this request provides an excellent lesson in the workings of the systems analysis process and an example of the means by which such analyses can run aground on the hard rock of reality.

In last year's Senate Armed Services Committee Report on the FY79 Defense budget, the Defense Department was asked to conduct a comprehensive study of all options and alternatives for maintaining an attack submarine force level of not less than 90 submarines. Partially as a result of the request contained in the Senate Armed Services report and partially, I suppose, as a result of intense pressure being placed on the Navy to reduce the cost of attack submarines, the Secretary of the Navy on May 22, 1978 asked the Assistant Secretary of the Navy for Research, Engineering and Systems to conduct a study not only of the nuclear attack submarines (SSN's) but also of the ballistic missile submarines (SSBN's). Its objective was to "define and analyze alternative nuclear submarine forces to satisfy the Navy's near-term objectives". The Secretary

stated that "attention should be directed to options which offer the prospect of significantly reducing costs while retaining operational adequacy".

The Secretary also requested the Chief of Naval Operations (CNO) to participate in the study by providing his concepts and to render all possible assistance. This point is significant because otherwise the study would have been conducted by people almost entirely outside the Navy, which would have excluded from involvement those people who have experience in and have responsibility for submarine operation. Apparently the Secretary understood the implication of this and wisely insisted on CNO's involvement.

Subsequently, a former Pentagon research executive and aerospace consultant was named the full time director of the study. He reported directly to the Assistant Secretary of the Navy for Research, Engineering, and Systems. It was well known that he had been selected as study director because of his competence and his lack of bias, so that he would not be unduly influenced by those experienced in submarine operations or be partial toward the LOS ANGELES Class submarines. There was established a Steering Group, an Advisory Committee, and a number of working groups composed primarily of civilian contractor personnel experienced in systems analysis. Some of the members selected to serve on these committees were people who had previously been active participants in opposing the building of the LOS ANGELES Class submarine back in the 1964-68 time frame.

Since it was the basic thrust of this study to establish an approach that would lead to the identification of lower cost submarines with acceptable military capabilities, it was evident to me that the results, if there ever were any, would probably not be likely to represent a proper, well reasoned approach. As a result I directed my people to cooperate to the fullest extent by providing whatever technical information

was requested, but not to become a member of the study group or get involved with the group's findings.

The Senate Armed Services Committee Report requested that the results of this study be presented to the Congress by February 1, 1979. In response to a request from Senator Stennis, the Defense Department finally released a draft of the results of the study to the Senate on June 8, 1979.

STUDY ATTEMPTS TO DISCREDIT HIGH SPEED

As best I can determine from the final draft of the report and from what my staff and I observed as the study progressed, the systems analysts attempt to produce the answer they thought was desired, has foundered on the hard reality of the CNO's insistance on an objective reporting of the results of the analysis.

The details of the final draft report show the approach being taken by the Pentagon to attempt to discredit the high speed capability of the LOS ANGELES Class submarine. First, they did not include in the numerical analysis those missions, such as direct support of high speed surface task groups and trailing of enemy submarines, for which the higher speed and more costly submarines were clearly best suited. Then they ensured that each mission scenario began with the U.S. submarine already in an advantageous position with respect to the enemy. A sophisticated underwater mine which could wait for the enemy to come near could also be effective with this kind of advantage.

The details of the final draft also provide graphic demonstration of the limitations of numerical analysis methods. When the problem became too difficult for even the most sophisticated computer to handle, such as when a U.S. submarine attacking an enemy surface task force fired a weapon in the middle of the enemy forces, they simply stopped

the analysis. The ability to get into position to fire a weapon became the measure of success. The success of that weapon, the ability of the U.S. submarine to evade counterattacks by a wide variety of enemy anti-submarine weapons, and the ability of the U.S. submarine to prosecute reattacks on the enemy task forces were predetermined to be unimportant. However, it is obvious that a high speed submarine has greater capability to evade weapons, reposition itself and reattack the task force.

Similarly, the numerical analysis could not evaluate the role of ship's speed in enabling a ship to recover from the inevitable miscalculations, errors in judgment, equipment failures, or incorrect choices of tactics which may have caused the ship to lose its tactical advantage. These factors cannot be subjected to numerical analysis and are thus ignored by the analysts.

RESULTS OF STUDY SUPPORT HIGH SPEED

The amazing thing, given all these biases, is that the final draft report does not present a clear case for the superiority of the slower, less costly submarines. On the contrary, the draft findings of the study show that, even in the limited missions analyzed, the higher speed submarines are most "cost-effective" by almost every method of analysis. How did this happen? Where did the systems analysts go awry?

To understand this, one must go back to the Secretary's initial decision to ensure the CNO's involvement in the study.

In late 1978, the preliminary draft report was circulated for review and comment. It was clear that the results emerging from the mission analyses were not supporting the lower cost, slower ship. And, in fact, many felt that the study showed the LOS ANGELES type submarine to be the most cost effective choice. In December, 1978, another member of the study group effectively took over control of the study when he

assumed the lead role for rewriting the study summary under the direct guidance of the Assistant Secretary of the Navy for Research Engineering and Systems. In the opinion of many, the resulting summary was not a credible document. The written findings contained within it attempted to minimize the performance difference between the various candidates and were not supported by the numerical analysis results in the body of the report. The resulting summary was reviewed by the CNO's staff and as a result the CNO, in a memorandum to the Secretary of the Navy dated February 8, 1979, stated that:

> "The Summary should give the decision makers an accurate overview of the entire study with a broad range of options. Moreover, this entire report must be a credible document to submit to the Congress. I do not feel that this draft version accomplishes this. I stand ready to provide every assistance toward achieving a mutually acceptable, credible report that will represent a coordinated Navy effort."

The result of the ensuing coordinated Navy effort is the "final draft" report which the Defense Department has forwarded to the Congress.

Apparently the Assistant Secretary of the Navy for Research, Engineering and Systems still believes that he has the right answer. A May 16, 1979 article in the Washington Post quotes him as stating that a smaller submarine could do the same job as the LOS ANGELES Class and cost about 20 percent less to build. The article quotes the Assistant Secretary as stating that the only penalty for building smaller submarines is a loss of "less than five knots in speed. This is not a critical difference." My understanding of the draft report is that the five knots does in fact make the critical difference. It is clear from the draft report that it is this speed advantage which makes the LOS ANGELES type candidate more cost-effective than the slower candidates, even in the limited scenarios analyzed. Surely when the higher speed missions are also considered the advantages of the LOS ANGELES Class must become even more apparent.

The Assistant Secretary is further quoted in this article as stating that the study panel found ways to make the nuclear reactor more compact, saving both weight and space. Since I am responsible for all developments in naval nuclear propulsion, I would , of course, be interested in any such improvements in nuclear reactor plant design. Since I could not find any reference to such improvements in the draft report, I called the Assistant Secretary to ask for his assistance. He too was unable to find such a reference. When I suggested that he may have been misquoted or misunderstood by the Washington Post reporter, he agreed and stated that he would correct the error. Apparently the press of other news events was such that the Washington Post was unable to print this correction.

The Assistant Secretary is also attributed in the July 18, 1979 edition of SEA POWER with a statement to the effect that new submarine designs could allow the elimination of redundancy in safety systems. I must assume that he has once again been misquoted.

CNO REQUESTS A FLEET ATTACK SUBMARINE STUDY

During the time frame of the study and recognizing the severe pressure being brought on the Navy by the Defense Department and the Office of Management and Budget to reduce the cost of attack submarines, the CNO in December 1978 directed that NAVSEA initiate a design study of a fleet attack submarine of a limited displacement. On April 9, 1979, NAVSEA forwarded to CNO a conceptual design study report for this Fleet Attack Submarine. This submarine is essentially an update of a previous submarine Class. It incorporates several improvements which would result in an increased submerged speed over the previous class. But this submarine would still be significantly slower than the LOS ANGELES Class. It should also be noted that incorporation of similar improvements into the LOS ANGELES Class would result in an increase in the submerged speed capability of the LOS ANGELES Class also.

Studies of both ships are continuing. Meanwhile the Fleet Attack Submarine has already been included in the Navy's Fiscal Year 1981 Program Objectives Memorandum and the first ship is scheduled to be authorized in Fiscal Year 1983. The CNO is scheduled to decide this fall which ship to build. I do not know what the CNO's decision will be. However, I would not be surprised to find that the CNO has recommended that a smaller Fleet Attack Submarine be built. The pressure being brought on the Navy and in particular on the CNO to reduce submarine costs, regardless of the impact on combat effectiveness is tremendous. The Navy is essentially being told that we will build cheap submarines or no submarines at all.

NAVY CAN BUILD CHEAPER, LESS EFFECTIVE SUBMARINES

There is no question that the Navy is perfectly capable of designing and building a cheaper submarine. To make a submarine cheaper all the Navy needs to do is tell its designers to remove certain capabilities. Each capability that is deleted or reduced, makes the submarine smaller, lighter, and thus cheaper. If you decide you don't want a certain speed capability, a certain quietness capability, a certain shock capability, a certain weapon capability, a certain depth capability, or the habitability that we now have, you can reduce them and the submarine will get cheaper.

It is just as easy for the Navy to do that as it is for Detroit to design and build cheaper automobiles; for the aero-space industry to design and build cheaper commercial passenger aircraft; or for the Army to build cheaper tanks. The question which must be answered is, will these cheaper versions serve the purpose for which they are intended? If Detroit builds a cheap automobile and nobody buys it, then the effort was a failure. In the automobile business you are dealing with a product that is produced by the millions and if a mistake is made on a given model, the company changes or drops that particular model, comes up with a new one the next year, and the problem goes away. With submarines we

are dealing with a small number of inherently expensive items that must last for 20 to 30 years. The mistakes we make today will haunt us long into the twenty-first century.

Building limited purpose submarines and submarines with no room for growth yields unfortunate results with which we must live for years. This situation is aggravated by the inherent limitation in capability which comes with age. We have made this mistake in the past. A mix of more capable and less capable submarines is inevitable due to the relative age of ships in a force which includes a range of ages up to 30 years. To design a submarine with limited capabilities or a submarine with no growth potential to accomodate technological advances serves to accelerate the rate at which the overall Submarine Force capability declines. Thus, a decision to build smaller, cheaper submarines -- which equates to a decision to build less capable submarines with less growth potential -- is a decision to limit force capability in both the near and the far term. Unfortunately, such a decision cannot be rectified during the 25-30 years such ships can be expected to serve in the fleet.

The resolution of this question will, as it always has, finally rest with the Congress. You are not likely to get a clear, well-reasoned recommendation from the Defense Department. You recall that it is Congress that can take the credit for the existence of the LOS ANGELES Class high speed submarine we now have and are continuing to build. The Defense Department fought the LOS ANGELES Class design all the way for years. Yet today it represents the most capable proven attack submarine in the world. Operational results prove it has capabilities no other U.S. submarine has in carrying out the many missions required of a modern attack submarine.

If the Congress now wants the Navy to build cheaper submarines, diesels included, all they have to say is "do it". However, the Navy should not be asked to state that it would prefer this instead of the

LOS ANGELES. Neither should the Navy be asked to produce studies which prove that the cheaper ships are as effective as the LOS ANGELES. Such studies are fraud. You do not get something for nothing.

Eventually you may receive a thick "study" containing the Defense Department's opinion of what kind of submarine we should be building. At this time I do not know what that study will finally recommend. It is quite possible that the Defense Department analysts will arrive at the absurdity that a diesel submarine is just as effective as a nuclear powered one. Using the same logic they could just as easily conclude that we should decommission all of our nuclear powered submarines. You may recall that several years ago the Defense Department systems analysts suggested that we consider saving money by sinking ten of our POLARIS submarines.

MOST CAPABLE SUBMARINES SHOULD BE BUILT

In looking at such studies and in considering what submarines the U.S. should build, we must consider that we have not fought a war at sea since 1945. We have never faced enemy nuclear submarines in war nor have we ever used our nuclear submarines in a real war situation. Moreover, the submarine we decide to build today will not go to sea for at least another nine years and must last well into the twenty-first century. A responsible official must assume that there will be many changes in the strategies and tactics of naval warfare in that time.

Knowing this, how can anyone, regardless of how brilliant he may be, come up with calculations that prove, in a theoretical and mathematical sense, just what capabilities our submarines should have? How can anyone know what the enemy will have in 20 to 30 years? How can we even guess? The Submarine Alternatives Study guessed that enemy submarines twenty years from now would have a given maximum speed and maximum depth capability. However these assumptions are reportedly already in jeapordy

due to the Soviet's ALFA class which is a new deep running fast nuclear attack submarine with an upgraded weapons system.

I have said many times before, in peacetime we should build the best and most capable weapon systems we can. In past wars, we have had the time to build additional weapons to make up for our shortsighted peacetime building rates. In a future wartime situation there will not be adequate time to build the complex ships which are the product of today's technology. The judgment as to what and how many ships we should build in peacetime is obviously a question involving many elements, not the least being how much money the Administration and Congress are willing to provide in competition with other national programs. But to build less capable submarines in peacetime would, in my opinion, be a grievous error.

PRESIDENT CARTER ENDORSES LOS ANGELES CLASS

President Carter clearly understands this situation as evidenced by a press conference statement to the American Press Institute on March 30, 1979. In response to a question as to whether the Navy should spend the available money for smaller, less expensive submarines rather than the current LOS ANGELES (SSN688) Class and TRIDENT submarines, the President stated:

> "Well, it costs so much to change designs, as you know, that I am not sure even a slightly smaller or different design would give us in the long run more submarines or more effective submarines.
>
> "As an ex-submariner, one who was in the initial program, I think I am personally biased. But I think that if there ever has been any one single weapon system that has insured our Nation's integrity and security, it has been the nuclear submarine, with a strategic weapon capability.

"It is a great insurer of the peace. And I think the TRIDENT and the 688 combination, as far as their immediate future is concerned, are the best we have to offer. And, of course, we are exploring new technologies and they will always be available for future designs. But to change from these two designs because there have been cost overruns, based primarily on natural inflation that has occurred, and an improvement in design during the construction phase, I think would be an error.

"So I don't think we will terminate those programs and change the design. I think they are very adequate, and I am very proud of what they have already done and what they will do in the future."

I find it hard to improve on the President's statement. I wish it would result in these studies being stopped so we can get on with our work. But these studies have a life of their own and they will go on and on as long as we have systems analysts in positions of authority over the operation and the technical people.

RECOMMENDATIONS

Insofar as attack submarines are concerned, my recommendations, you may be assured, are not based on systems analysis, computer studies, or war game scenarios. They are based on years of experience in the design, construction, and operation of submarines, knowledge of ships and history, intuition (trained intelligence), and just plain common sense. I am sure that, for these reasons alone, the Defense Department "studiers" would reject them. My recommendations are:

Continue building the LOS ANGELES Class. Today, it represents the best submarine available. Vigorously support attack submarine research and development efforts to ensure that the quality of our force is not

allowed to stagnate. In addition, continue reviewing the design of the LOS ANGELES Class to see what improvements can be made.

Remember, the LOS ANGELES was designed over ten years ago, and since that time we have learned much about its operation, and there have been many new technological developments. These lessons and developments need to be incorporated into later designs. Thus, a reengineered LOS ANGELES might come out smaller but then again, it might not. But to go back to any previous submarine Class with their reduced capabilities would be sheer nonsense. Recall, it was Congress that forced the Navy to build the LOS ANGELES in the first place, because of our continuing loss of speed capability in comparison to what was seen in the Soviet nuclear submarines. The idea of intentionally building a slow submarine just to save money strikes at the core of absurdity.

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